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IMPACT OF INTENSIVE, HIGH-RISE DEVELOPMENT IN SAN FRANCISCO

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AN EVALUATION OF ALTERNATE DEVELOPMENT GROWTH STRATEGIES

STEP 1 - PART B
A FINAL FEASIBILITY REPORT

VOLUME III
URBAN ECONOMICS

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SPUR

SAN FRANCISCO PLANNING AND URBAN RENEWAL ASSOCIATION
126 Post Street, San Francisco, California 94108

STUDY OF INTENSIVE, HIGH-RISE DEVELOPMENT IN SAN FRANCISCO
STEP 1 - PART B
A FINAL FEASIBILITY REPORT
APRIL 1973

PREPARED FOR SPUR
BY THE STUDY TEAM OF:

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This Study is being undertaken through funds provided by the U.S. Department of Housing and Urban Development (HUD), the San Francisco Foundation, and the Mary A. Crocker Trust.

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KEYSER-MARSTON & ASSOCIATES

June 5, 1973

Mr. Robert C. Kirkwood
President
San Francisco Planning and Urban
  Renewal Association
126 Post Street
San Francisco, California 94108

Dear Mr. Kirkwood:

We are pleased to transmit the report of the study team concerned with the Urban Economic's portion of Step 1 - Part B of the Study of the Impact of Intensive, High-Rise Development in San Francisco.

This report represents a joint effort by several firms. David M. Dornbusch & Company, Inc. had primary responsibility for Chapter A, Business Activity, and Chapter B, Employment and Earnings. Larry Smith & Company, Inc. had primary responsibility for Chapter C, Transportation. Keyser/Marston & Associates had primary responsibility for Chapter D, Housing and Land Use.

The chapters of the report describe a variety of methods and data sources that can be used to examine the impacts of future development policies on San Francisco's economy. These methods were originally proposed in our Step 1 - Part A Report on the same subjects. During Part B of this study step, data access has been obtained and data has been evaluated for its quality and suitability for our purposes. Using the data, our methods were tested and refined as necessary in order to establish the feasibility of the work we have proposed for future study steps.

In the next part of the Study, future growth of San Francisco under alternate development policies will be described in terms of block types. Block types, and the way in which they are used to produce scenarios of growth, are explained in Volume I of this report and in the Summary Volume. Then, the methods described in this volume are applied to the scenarios in order to produce projections of social and economic impact.

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In broad terms, the procedure that will be used is as follows. First, the reactions of business firms to growth policies will be analyzed, and the decisions of firms with respect to their location within the city will be projected. On the basis of these results, employment projections for the city will then be established. This, in turn, will allow projections of both earnings -- wages, salaries, and property income -- and changes in retail sales. Thus, business activity, employment, and earnings are forecast directly from the scenarios.

Also, the travel demands implicit in each scenario will be projected. These will be derived from the employment projections above. By knowing the new employment levels, and where employees are located, an analysis can be conducted of changes in the number of trips that will be made, the volume of vehicular flow on streets and highways, and the costs that will be faced by public bodies charged with the maintenance of transportation networks. By using additional information on the capacities of existing transportation systems, projections can also be made of changes in the potential for traffic congestion.

In the final part of the analysis, we will explore the ways in which the employment projections discussed above will affect the residential neighborhoods of the city. First, we estimate the proportion of new employees that will choose to reside within the city of San Francisco, and where within the city they will prefer to live. Our methods then allow us to estimate the impact of these choices on housing values, rents, and pressures for new residential construction. Pressures for significant demographic changes within certain neighborhoods can also be examined.

Taken together, the methods comprise a complex yet systematic procedure for analyzing the social and economic effects of intensive, high-rise growth. The complexity is forced by our subject matter. Intensive, high-rise growth has pervasive effects throughout the urban economy, and a study as comprehensive as ours must reflect the many complex interrelationships that are possible in the economy itself.

In another sense, our procedure is complex in that it represents a weaving together of both old and new methods of economic analysis. As we have found in our reviews of existing economic literature,

the role of high-rise development in urban growth has rarely been directly addressed in ways that are useful to urban policy makers and concerned citizens. In some cases, we have been able to adopt and adapt methods of economic analysis previously used and tested in studies of related urban economic problems. In many cases, however, our subject matter and our goals of comprehensiveness have forced us to develop new methods of analysis suitable for our purposes.

The success of our efforts to date, that is to say the utility of the methods we have developed, is reported in the separate chapters of this volume. We believe that the methods presented are feasible and represent the most efficient allocation of the resources for research available to us. More importantly, we believe that they will produce information that will be useful in making decisions about San Francisco's future. For these reasons, we look forward to the opportunity to proceed to the remaining steps of this exciting and important project.

Very truly yours,

KEYSER/MARSTON & ASSOCIATES

A. Jerry Keyser

A. Jerry Keyser
Partner

AJK:lm

SUBJECT	UNIT OF MEASUREMENT	DESCRIPTION OF PROPOSED METHOD	VARIATION OF MEASUREMENT	SOURCES OF DATA	AMOUNT OF DATA REQUIRED	AVAILABILITY OF DATA	MANIPULATION OF DATA	RELIABILITY OF FORECAST	STATUS OF IMPACT MEASUREMENT
III. ECONOMICS									
4. Firm Locations	Square feet by SIC Code.	Sensitivity to Locational Parameters - Amount.	Complex	HRD, Realtor (Unique To S.F.), EEOC.	20% sample of firms in city.	Data obtained.	Computer	Medium	Refined and ready for computation.
5. Retail Trade									
a. Commuters	Dollars	Survey Amount - BATSC.	Complex	Survey (Unique to S.F.).	200 sample	Data obtained.	Computer	High	Same as above.
b. Residents	Dollars	Projection of Data - Amount	Complex	BLS.	Published data	Data obtained.	Computer	High	" "
c. Effect of Amenities	Qualitative	Survey - Number and Amount	Complex	Survey (Unique to S.F.).	200 sample	Data obtained.	Computer	Medium-Low	" "
6. Construction and Investment	Dollars	Projection of Present Profit - Amount	Linear with Amount of Development.	Interview - (Unique to S.F.) BLS, N. Calif. Real Estate Report.	Published data	Data obtained.	Hand	Medium	" "
7. Tourism	Qualitative	Survey - Amount and Form	Unknown	Survey of Visitors (Unique to S.F.).	Published survey	Data obtained.	Hand	Low	" "
8. Quantity and Type of Jobs									
a. Office	Number of persons by occupation, race, & sex.	Multiply EEOC matrix by job charges - Amount	Complex	EEOC	EEOC tables	Data obtained.	Computer	High	" "
b. Construction	Same as above.	Same as above.	Complex	BLS	Published tables	Data obtained.	Hand	High	" "
c. Maintenance	Same as above.	Same as above.	Complex	BOMA	Published tables	Data obtained.	Hand	High	" "
d. Retail	Same as above.	Same as above.	Complex	Census	Published tables	Data obtained.	Hand	High	" "
9. Employee Residence Location	Same as above for S.F. and non-S.F.	Projection of past location - Amount	Complex	BATSC (Unique to S.F.).	Published tables	Data obtained.	Computer	Medium	" "
10. Earnings	Dollars per person by occupation, race, & sex.	Multiply employment charge by earnings data - Amount	Complex	Census	Published table	Data obtained.	Computer	High	" "
11. Unemployment	Qualitative by occupation, race, & sex.	Comparison of profiles - Amount	Complex	Census	Published data	Data obtained.	Computer	Low	" "
12. Trip Generation	Trips per 1,000 sq. ft. of land use.	Application of derived standards to changes in amounts of land use by type as described in scenarios.	Sensitive to amounts and intensity of land use rather than distribution.	Independent survey.	14 surveys	Good - standard technique.	Computer	Excellent	Well-tested, operational.
13. Traffic Flows	Vehicles per hour per route.	Allocate trips generated to routes based on existing ratios of volumes on routes.	Sensitive to amounts and distribution of land uses volumes.	Traffic flow maps - Dept. Public Works, Division of Traffic.	24-hr. & peak hour maps.	Excellent	Manual	Good	Operational
14. Relative Level and Location of Congestion	Vehicles per route.	Compare allocated traffic flows on routes to standard capacity of routes.	Sensitive to amounts and distribution of land use.	Dept. Public Works, ITTE	Limited-Capacities for three road types (highways, city streets, residential streets)	Available	Manual	Good	Operational.
15. Public Costs of Increase in	Dollars per vehicle per trip or vehicle mile, as appropriate.	Apply ratios of costs per unit of measurement to increases in units of measurement associate with each scenario.	Sensitive to amounts and distribution of land use.	Dept. Public Works, Municipal Railway, Calif. Dept. of Highways, BART, AC Transit.	Relatively small.	Available (access pending)	Manual	Good	Operational.
16. Residential Location Choice	Number of persons per neighborhood.	Allocation of San Francisco downtown employment increases to residential neighborhoods.	Very sensitive to amount of development, somewhat sensitive to development location.	U. S. Census (Survey optional and desirable).	Moderate	Available	Hand (Computer optional and desirable)	Depends on accuracy of employment projection and assumptions about future accessibility.	Operational (options not developed).
17. Housing Market Impact	House values, rents, construction rates.	Establishment of relationship between employment induced demographic changes and housing indications.	Dependent upon residential location choice model.	U. S. Census.	Moderate	Available	Computer	Subject to statistical tests.	Needs further testing.
18. Neighborhood Demographic Change	Socio-economic population characteristics.	Comparison of characteristics of new residents and previous residents.	Sensitive to type, location, and amount of development.	U. S. Census	Considerable	Available	Hand	Dependent upon accuracy of residential location choice model.	Operational.

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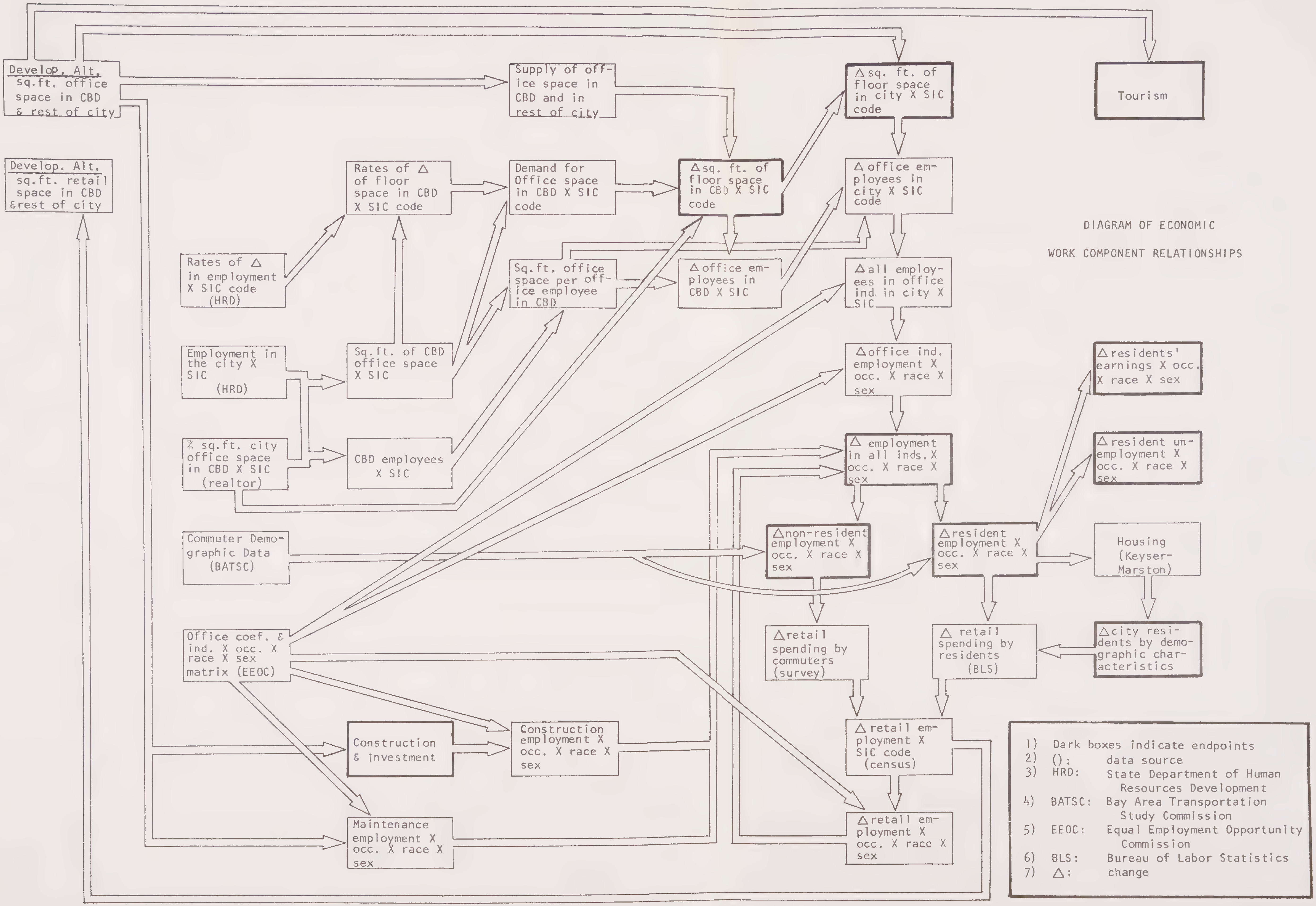

DIAGRAM OF ECONOMIC WORK COMPONENT RELATIONSHIPS

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A. BUSINESS ACTIVITY

1. Firm Locations

The basis for this section is the hypothesis that different development alternatives will affect business activity in differing manners. For example, high density or high-rise development affects business activity differently than does an alternative form of development by causing a different mix of firms to locate within the city bounds. We are interested in determining what firms will do business in San Francisco under various development alternatives in order to note the effects on the type of economic activity which takes place in the City, the type and quantity of city jobs, and the impact on investment and earnings of the various participants in the City's economy. Given that our objectives all deal with a change in the present situation, what we are interested in determining is which firms will leave and which will come under the conditions imposed by each of the given development alternatives.

a. Methodology

The basic method by which we propose to analyze the effect of a given building alternative involves two preliminary procedures. First, we must identify types of firms which are useful in discussing locational decisions. We must determine meaningful ways to group the many firms in the city in order to determine the impact of firm location on business activity and employment. The types chosen must adequately describe the major features of a firm which determine its locational preference. For example, the type of business which a firm transacts is one determinant of location.

Second, the method involves the identification of various parameters which describe a location. For this analysis, we are only interested in those parameters which are both affected by a development alternative and which are a consideration in a firm's locational decision.

Once these firm types are chosen and the parameters are determined, we analyze two relationships. First, we analyze the importance of the parameters to the various types of firms. We do so by studying a sample of city firms and noting their locational preferences with regard to the parameters. For example, we may note that eighty percent of the stockbrokers in the City locate above the twenty-fifth floor of a building. This high percentage shows that stockbrokers have a definite preference for high-rise buildings. Second, we analyze the effect which a given development alternative has on each of the parameters. For example, the development alternative may provide no new high-rise buildings. Under this alternative, stockbrokers may have difficulty in finding a desirable location.

b. Test of Method

We have decided to test our method of analysis in two stages. In the first stage, we identify the relevant classifications of firms. We also determine all of the locational parameters which are directly affected by a development alternative and note which of these parameters are important to which particular types of firms. In the second stage, we use the information obtained in the first to establish a framework to analyze the effects of a given development alternative on firm locations.

(1) Typing of Firms and Determination of Parameters

(a) Data

We have used two main sources of data in our locational analysis. (The way in which they interact is described in section (2) where we develop our analytical framework). The first source of data is the March, 1972 office prospect file of a large local real estate agency. (The agency has asked not to be identified). From it we have developed a data base which includes information on 3,911 San Francisco firms with over one thousand square feet of floor space. Our sample is quite good in that it includes approximately 20.6 percent of the firms in the City.[1] Since this 20.6 percent includes more larger firms, the sample includes more than 20.6 percent of the floor space. Most of the firms in the sample (3,262) are non-headquarters offices. The sample includes no space which is totally non-office. It does, however, include 489 non-headquarters firms which we refer to as partially industrial. These partially industrial firms locate office and another type of activity together. An example of such a firm is a wholesale establishment which has an office and warehouse in the same building. In addition to the non-headquarters, the sample includes 105 office headquarters and 55 partially industrial headquarters. The sample includes no retail-type floor space.[2]

Each firm in the sample is described in terms of characteristics which are potentially useful in determining firm types and locational parameters. Those characteristics which are useful in typing firms are the two-digit Standard Industrial Classification (SIC) Code (see Appendix A1-2) and size.[3] Those useful in determining locational parameters are building, area of the city (see Appendix A1-3), and floor of building.[4]

The second source of data which we have used is employment data for San Francisco County by two-digit SIC code published quarterly by the California Department of Human Resources Development. This data includes workers covered by the California Unemployment Insurance Code and is sufficient for the purpose for which we use it in the analysis (see section (2), Analytical Framework).[5]

(b) Development Alternative

In order to meaningfully select the types of firms which are to be discussed and the parameters which they use in making their locational decisions, we must first consider the terms in which the development alternatives will be expressed.

The hypothetical plans for development of the City will deal mainly with the Central Business District (CBD) (see Appendix A1-3, Area 1), detailing, by block, the amount of floor space of various types (office, industrial, retail) on various floors. Given the present block profile of the CBD, we will, therefore, know how a given alternative will change these amounts. The other areas of the City will be described in more general terms.

Since pressure will be placed on the supply of space principally within the CBD, we will begin with an analysis of firm locations within the CBD and then consider what pressures, if any, this will put on other areas of the City.

(c) Selection of Firm Types

Given that we are mainly dealing with the CBD, we have typed firms according to three criteria. These criteria were chosen because they are generally considered to be the major factors in determining a firm's locational preference. The first criterion is whether a firm is an office, industry or retail establishment. Each of these types of firms requires a different form of physical space, and under a given development alternative, a firm of one type will very seldom compete for space with a firm of another type. For example, a retail store cannot locate in a building which is entirely designed for offices.

We will analyze in great detail the pressure which the development activity puts on office space and the way

in which various types of office firms compete for this space. The detailed analysis is made necessary for two reasons. The first is that most of the CBD is composed of office buildings (see report on Block Types), and therefore, office activity is quite important. The second is that different types of office firms have different types of employees and perform different types of economic activity. Since our purpose in analyzing firm location is to determine its effect on these factors, we must note the location of detailed types of office firms.

We have further divided the office category into two parts: 1) large headquarters, and 2) small headquarters and non-headquarters. This division is useful in our analysis in that we feel that a large headquarters may require a different type of physical space than a non-headquarters office firm. For example, a large headquarters firm may require its own building.

Small headquarters act more like non-headquarters than like large headquarters in their choice of location. They do so for two reasons. First, they do not require a large amount of space under one roof and, therefore, do not have the desire to build their own building. They are forced to choose among available space. Second, like non-headquarters, they do not have in-house professional staffs and services. Therefore, they, like non-headquarters, are influenced by proximity to these facilities in their locational decisions.

Unlike office firms, retail firms are considered one type of economic activity. The impact which retail firms have on the employment structure does not depend on the type of good sold, and therefore, we consider retail firms (SIC 51-59) as a whole and do not analyze the competition for space among the various types.

Finally, as in the case of retail firms, we do not analyze competition for industrial space in the CBD in detail. Such an analysis is unnecessary because of the small amount of industrial activity in the CBD.

The second criterion which we used to type firms is the two-digit Standard Industrial Classification (SIC) Code. This criterion was chosen for two reasons.

First, firms which are assigned different SIC codes are engaged in different activities. Thus, they have preferences for different types of locations. Second, the type of economic activity in the City and the types of jobs available vary with each type of SIC code. Given that our purpose in determining the impact of a development alternative on firm location is to measure the economic activity and employment, the SIC code for firms is quite useful.

The third criterion which we use to classify firms is firm size. Since type of economic activity and type of employment do not vary significantly with firm size, we only consider size as a factor influencing locational decisions after we consider SIC code.

(d) Selection of Locational Parameters

Of the many criteria which play a role in the determination of a firm's location, only four are directly affected by proposed development alternatives of the CBD. These are the following: 1) proximity to the CBD, 2) floor level, 3) type of space (office, retail, industry), and 4) rent level. A development alternative affects the choices available to firms in terms of a CBD location and floor level by providing a certain quantity and type of space in the CBD on various floors. This supply of space then interacts with demand for space to determine rent levels.

Given that most of our analysis is in terms of the CBD, our discussion will be centered around office space and the types of firms which will locate within it. We use the locational parameters in order to determine where non-headquarters and small headquarters office firms will locate under a given development alternative. (See section (2), Analytical Framework, for a discussion of industry, retail and large headquarters firms). In order to do so, we must determine the sensitivity of our sample firms to these parameters.

1) Floor

Using our sample of firms to calculate floor distribution by SIC code, we find that, in most cases where an adequate number of firms is included in the sample, firms of various types locate on almost every floor.[6] (See Table A1-1). This implies that if a development alternative constrains the amount of floor space on a given

Table A1-1

Percent of Firms by Floor in Central Business District

SIC Code	Floors 1	2	3-10	11-25	Greater than 25
7	--	50	50	--	--
8	--	--	100	--	--
9	--	--	--	100	--
10	--	--	--	--	100
13	--	--	100	--	--
15	--	17	50	33	--
16	33	--	17	50	--
17	--	33	33	33	--
20	13	13	63	13	--
23	--	--	100	--	--
24	--	--	50	50	--
25	100	--	--	--	--
26	--	--	67	33	--
27	33	22	33	11	--
28	9	9	18	45	18
29	--	--	--	--	100
30	--	100	--	--	--
31	--	--	100	--	--
32	--	--	50	--	50
33	--	--	67	33	--
34	20	20	--	40	20
35	--	--	--	80	20
36	--	--	100	--	--
37	--	100	--	--	--
38	33	33	33	--	--
39	--	--	33	67	--
40	--	--	33	50	17
41	--	--	--	100	--
42	20	20	40	20	--
44	--	--	38	38	23
45	15	8	46	23	8
46	--	--	100	--	--
47	5	9	60	23	3
48	17	25	46	8	4
49	13	--	63	13	13
50	8	8	46	29	8
60	59	5	19	7	10
61	41	3	24	21	12
62	7	5	35	28	25
63	15		65	20	--
64	7	7	54	25	7
65	12	8	35	20	25
66	25	--	25	25	25
67	--	6	39	33	22
70	20	--	20	20	40
72	33	17	50	--	--
73	8	6	50	27	10
75	--	--	100	--	--
76	--	--	67	33	--
78	--	--	--	33	67

Table A1-1 (cont.)

	Floors				
SIC Code	1	2	3-10	11-25	Greater than 25
79	--	--	75	--	25
80	22	--	33	33	11
81	1	6	48	35	11
82	--	25	75	--	--
84	--	--	100	--	--
86	7	15	52	19	7
89	8	13	51	18	10

Source: Office Prospect File, Local Realtor

floor (above floor 25, for example), a firm which may prefer to locate at this level would locate elsewhere. It would not leave the CBD or the City in order to find space on the desired floor. Thus, floor is not a determining factor in a firm's locational decision.

2) Proximity to the CBD

Our analysis using the sample data indicates that proximity to the CBD is a very significant factor in some firms' locational decisions and varies greatly among SIC codes. For example, 95 percent of the firms in SIC 62 locate within the CBD whereas only 53 percent of SIC 61 does so. We can, therefore, assume that a firm in SIC 62 would be more likely to be found in the CBD under a situation of constrained development than would a firm in SIC 61. Because of these obvious differences, we use desire for proximity to the CBD as a criterion for determining which types of firms will be found in the CBD under a development constraint.

When firms are classified by size, rather than by type, proximity to the CBD does not seem to be a determinant of locational choice. In Table A1-3 we note that in our sample nearly the same percentage of each size of firm locates in the CBD.

Table A1-3

Percent of Firms of Various Sizes in the CBD

(in square feet)

Size

Less than or Equal to 2,499	2,500-7,499	7,500-14,999	15,000-32,000	Greater than or Equal to 32,000
68.5	67.2	66.2	66.9	39.4*

*This low percentage is caused by a few large firms with multiple locations such as Pacific Telephone & Telegraph and Pacific Gas & Electric. We have determined through interviews that their locational decisions are not a direct function of size.

Thus, we will analyze proximity to the CBD in terms of firm type by SIC code but not by size.

3) Rent Level

Rent levels are known to be an important determinant of a firm's choice of location. Certain firms are willing to pay higher rents than others in order to obtain a desirable location. We have used two surrogates for rent. The first is the percentage of firms in the CBD. Interviews with realtors have shown that office space in the CBD is more expensive than similar office space in other areas in the City. Thus, firms with a higher propensity to locate in the CBD are less sensitive to rent levels and are more sensitive to location than are others.

The second surrogate for rent is the percentage of firms located above the twenty-fifth floor. This office space is the most expensive in the City because of the view available. A comparison of Tables A1-1 and A1-2 show that these surrogates are valid. The tables are consistent in that SIC codes which have a high percentage of firms in the CBD also have a high percentage above the twenty-fifth floor. For example, 95 percent of the firms in SIC code 62 are in the CBD of which 25 percent are above the twenty-fifth floor. Eighty percent of the firms in SIC code 65 are in the CBD of which 25 percent are above the twenty-fifth floor. Thus, by analyzing a firm's locational choice in terms of its desire to be in the CBD, we are effectively analyzing its sensitivity to rents.

In order to obtain further information on rent levels paid by various types of firms, we surveyed nine downtown high-rise buildings with high rent levels and nine buildings with lower rent levels. The rent levels in the low rent buildings ranged from \$.42 a square foot to \$.52 a square foot. Those in the high-rise buildings ranged from \$.65 a square foot to \$.80 a square foot.[7] We ranked firms by rent level using the building types and floors, and determined that the highest rent is paid by firms which locate above the twenty-fifth floor in the high-rise buildings. The lowest is paid by those in the low rent buildings. Appendix A1-4 details the

Table A1-2

Distribution of Firms by Area
(in percent)

	Area					
SIC Code	1	2	3	4	5	Total no. of firms in all areas
7	100	--	--	--	--	2
8	100	--	--	--	--	1
9	100	--	--	--	--	1
10	100	--	--	--	--	1
11	--	--	--	--	--	--
12	--	--	--	--	--	--
13	50	--	50	--	--	2
14	--	--	--	--	--	--
15	60	20	20	--	--	10
16	75	--	25	--	--	8
17	66	11	11	--	11	9
19	--	--	--	--	--	--
20	50	19	6	25	--	16
21	--	--	--	--	--	--
22	--	--	100	--	--	1
23	20	20	60	--	--	10
24	33	33	33	--	--	6
25	100	--	--	--	--	1
26	75	--	--	--	25	4
27	44	3	51	2	--	68
28	92	--	8	--	--	12
29	50	--	50	--	--	2
30	100	--	--	--	--	1
31	100	--	--	--	--	1
32	67	--	--	33	--	3
33	75	--	25	--	--	4
34	63	12	25	--	--	8
35	56	11	33	--	--	9
36	50	--	50	--	--	2
37	100	--	--	--	--	1
38	60	--	40	--	--	5
39	38	25	25	12	--	8
40	24	8	68	--	--	25
41	100	--	--	--	--	1
42	56	11	11	22	--	9
44	77	12	12	--	--	17
45	29	67	4	--	--	45
46	100	--	--	--	--	1
47	75	14	10	1	--	107
48	53	7	29	4	7	45
49	67	8	25	--	--	12
50	64	5	24	4	3	309
60	56	11	16	7	10	105
61	53	12	15	6	14	66
62	95	2	2	1	--	169
63	87	4	--	4	4	23

Table A1-2 (cont.)

SIC Code	Area 1	Area 2	Area 3	Area 4	Area 5	Total no. of firms in all areas
64	84	5	6	2	3	386
65	80	3	12	1	4	69
66	89	--	--	11	--	9
67	100	--	--	--	--	20
70	71	29	--	--	--	7
72	42	21	37	--	--	19
73	69	9	19	1	2	423
75	33	33	33	--	--	3
76	75	--	25	--	--	[illegible]
78	17	33	16	5	28	18
79	56	--	11	11	22	9
80	38	42	12	--	8	24
81	75	8	9	--	[illegible]	463
82	33	25	29	--	13	24
84	100	--	--	--	--	1
86	41	22	28	1	8	155
89	65	6	25	--	11	315

Source: Office Prospect File

number of firms of various types which fall in the rent categories determined.

(e) Final Firm Types and Important Locational Parameters

The preceding analyses of firm types and locational parameters leads us to the conclusion that we are able to determine the impact of a given development alternative on the locational distribution of firms by analyzing firms in terms of SIC code and the strength of their desire to be in the CBD. A development alternative will, therefore, affect firm location to the extent that it will constrain the amount of office space in the CBD.

(2) Analytical Framework

Because we are interested in development of the CBD in this study, most of the analytical framework developed to analyze the impact of the development on the location of firms deals with office firms. We will deal with industrial and retail-type space after developing and discussing the framework for office firms. The manufacturing SIC codes are considered in the office analysis only to the extent that many firms in these industries have separate office locations.

The framework for analyzing the impact of a development alternative on office firms has three main parts. The first is a model of the supply and demand for office space in the CBD under a given development alternative. The second part includes a discussion of who will locate in the CBD under various office supply constraints. We will use our locational parameters and firm types to determine which types of firms will first leave the CBD and then the City entirely. Third, we generalize our analysis to the City as a whole. We consider the supply and demand for office space in other areas of the City under a given development alternative and note where pressures on space will arise.

(a) Supply and Demand for Office Space in the CBD[8]

We use a supply and demand model for office space in the CBD in order to note whether a given development alternative places a binding constraint on office space. If so--if demand for space is greater than the supply--the excess demand will cause rents to rise, forcing those who are the most rent sensitive or have the least desire to locate in the CBD

to leave. Rents, however, will begin to rise a little before the demand exceeds the supply. They start to rise after the amount of available space falls below a normal desirable vacancy factor. This vacancy factor (V_n) is necessary in order to allow tenants and owners to schedule moves. In our model we, therefore, expand the concept of total demand (D) to include this vacancy factor. This new demand is called expanded demand or D*. We note that $D^* = D/1-V_n$.[9]

In the model we hypothesize four main sources of demand for office space in a given year: 1) existing tenants expanding their space requirements (D_1); 2) new tenants moving from other cities (D_2); 3) new tenants emerging from start-up business ventures in the community (D_3); and 4) existing tenants in buildings forced to relocate because their present office space is being removed (D_4).

We hypothesize five main sources of supply: 1) existing tenants going out of business (S_1); 2) existing tenants reducing space requirements (S_2); 3) existing tenants moving to other cities (S_3); 4) new office space added (S_4); and 5) vacant space available from the previous year (S_5). Given supply and demand for a development alternative, a positive result to the following equation means that the development alternative being considered will result in excess demand for office space, causing rents to rise:

$$D^* - S = 1/(1-V_n)\left[(D_1 + D_2 + D_3) - (S_1 + S_2 + S_3) + D_4\right] - (S_4 + S_5)^{10}$$

A major assumption that we are making in using this model is that all office space in the CBD is of one type. Although, this is not actually true, the assumption is valid, given our limited purpose in using the model. We are using it to determine demand pressure on office space in order to know which firms will be forced out of the CBD in a situation of excess demand. Because of our analytical method of doing so (see following part on Demand for Space), the same firms will leave the area irrespective of the type of space for which demand pressure originates.[11]

1) Demand for Space

In calculating the demand side of the model, we consider D_1, D_2, and D_3 together. This method

assumes that the expanding tenants and new tenants causing these demands act in the same manner with regard to their locational decisions. At this point in the analysis, we are only interested in the decision of whether or not to locate in the CBD. Our assumption is valid since we have found previously (see section (1), part (d) on locational parameters) that size is not an important determinant of this decision.

We are interested in determining D_1, D_2, and D_3 by SIC code, since we have found that this classification of firms is the most useful for our purposes. In performing this calculation, we first determine the total amount of office space occupied in the CBD by SIC code and then determine the rate at which it is growing.

We calculated the total amounts of office space in the CBD in two steps. First, we found the amount of total office employment in the CBD in each SIC code. This was done by first multiplying employment in the City in each SIC code[12] times the percentage of employees who are office workers in order to determine the number of office employees in the City by industry.[13] In order to convert this figure to office employment in the CBD, we used our sample of firms from the realtor's Office Prospect File. From this file we have determined the ratio of office space in the CBD to office space in the City for each industry.[14] (See Appendix A1-5). Multiplying total office employment in the City by this ratio yielded the desired measure. (See Appendix A1-6). Thus, the process is the following:

$$E_{CBD}\,(SIC) = E_C(SIC) \times Offco \times Rate(SIC)$$

where 1) E_{CBD} (SIC) is the total employment in the CBD by SIC code

2) E_c(SIC) is the total employment in the City by SIC code

3) Rate (SIC) is the ratio of CBD floor space to total City floor space by SIC code.

4) Offco is the percentage of employees who are office workers.

Second, we converted the amount of office employment in the CBD in each industry to total occupied floor space. (See Appendix A1-6). We constructed

the ratio of office employment in the CBD for each industry to total office employment in the CBD. We then multiplied this ratio by the total amount of occupied office space in the CBD.[15] The process is represented in the following equation:[16]

$$F_{CBD}(SIC) = BOMA \times \frac{E_{CBD}(SIC)}{E_{CBD}(Total)}$$

where 1) $F_{CBD}(SIC)$ is total floor space in the CBD occupied by a given SIC code

2) BOMA is the total amount of occupied floor space in the CBD determined from the Building Owners and Managers Association

3) $E_{CBD}(SIC)$ is the office employment in the CBD

4) $E_{CBD}(Total)$ is the total office employment in the CBD.

The above calculation, in multiplying the employment ratio by total floor space, implicitly assumes that the floor space is evenly distributed among employees in various SIC codes. Given that we are only interested in this analysis to indicate the extent of firm relocations which will occur under a given development alternative, this assumption is valid.

We have performed a check on the accuracy of our method by dividing total office floor space in the CBD by total office employment. This calculation shows that there are 200 square feet of office space per employee. This is above the 141.7 square feet which the Building Owners and Managers Association calculates for San Francisco in its Office Building Experience Exchange Report. We feel that the closeness of our result to the BOMA figure and the fact that our result is high is encouraging. We expected our figure to be high because of the fact that we based our "percent of employment which locates in offices" on figures from the New York City Region. These "office coefficients" are lower than those which we expect to find for San Francisco in that the New York Region is much more highly industrial. The lower coefficients allocate too small a portion of the employees to office space and, therefore,

cause the space per employee to be exaggerated.[17] For Phase III, we will determine the exact "office coefficients" for San Francisco from the EEOC data, and we expect our final calculations of floor space per worker to check with the BOMA estimate.

After finding the amount of total office space in the CBD by industry, we use it to calculate the next year's demand for CBD floor space by that industry. We do so by multiplying the floor space figure by the growth rate of employment in each SIC code. This growth rate has been calculated using annual employment data from the Department of Human Resources Development from 1962 to 1971.[18] Appendix A1-7 shows these growth rates. In the cases which matter in the analysis (see part 2 on Supply of Space immediately following), the power of these rates to accurately predict growth is high--indicated by the high R^2.

The above calculation assumes that the growth rate in office employment in an SIC code in the CBD is the same as the growth rate in all types of employment in an SIC code in the City as a whole. This assumption is discussed in footnote 19.

D_4, or the demand for office space created by tenants whose office buildings are razed, is determined directly from the development alternative. The development alternative will determine which buildings are replaced and in what year. We will use the San Francisco Polk City Directory to identify the firms who occupy the building (by floors) at the present and a assume they will be the same just before the new building is developed. We can approximate the amount of floor space occupied by each firm from data on the square feet of space per floor and number of firms on the floor. Next, we will aggregate this space by SIC code. Only a portion of the displaced firms will desire to relocate in the CBD. We will assume that they will do so in proportion to their tendency to locate within the CBD. (See Table A1-2). We have tested this assumption and have found it to be accurate. This fact was determined in a study of the relocation of firms replaced by high-rise buildings in San Francisco over the past four years. We

found that the percentage of these firms who relocate in the CBD by SIC code highly correlates with the proportion of firms in that SIC code which is found in the CBD. See Appendix A1-8 and Table A1-2 for the results of the study.[20] For example, our survey shows that 75 percent of the firms in SIC code 64 that are replaced relocate in the CBD, and the sample of firms in Table A1-2 shows that 84 percent of the firms in SIC code 64 are in the CBD.

In using our sample distribution of firms, we may be slightly overestimating the proportion who will relocate in the CBD. This is due to the fact that it is usually the marginal firms in a given SIC code which are found in the least expensive office space who are replaced.

2) Supply of Space

The determination of the supply of office space in the CBD proceeds in three steps. First, the supply resulting from existing tenants going out of business (S_1), existing tenants reducing space requirements (S_2), and existing tenants moving to other cities (S_3) is determined together. They are found in a manner which parallels that of determining $D_1 + D_2 + D_3$ from the negative growth rates of those SIC codes whose employment in the City is decreasing and the amount of office space which they occupy in the CBD. Second, the amount of new office space added to the CBD (S_4) will be derived from the development alternative. And third, the amount of vacant space (S_5) will be determined from the Building Owners and Managers office occupancy survey.

The normal desirable vacancy factor (V_n) is calculated as five percent of total available floor space in the first year of the analysis. The total floor space is determined by the BOMA survey.

3) Dynamics of the Model

The model, as discussed thus far, has dealt only with a single, base year, and we have developed the data to determine the model for the present. Given any development alternative, it can be

manipulated dynamically, through time, since our development alternatives will be expressed in figures which will be compatible with the model.

(b) Firm Location Analysis

1) Unconstrained Development

Our model of office space in the CBD will predict either an excess supply of or an excess demand for space in the CBD. (Equilibrium is similar to a situation of excess supply in that the supply of space is not a constraint). The situation of excess supply, which is currently the case in San Francisco, is the most uninteresting in our firm location analysis. It implies that any firm which desires to locate in the CBD will be able to find office space. In this situation, the quantity and type of space are not significant factors in a firm's locational decision. These parameters, therefore, will have no effect on present trends in who is locating in the CBD.

2) Constrained Development

Our discussion of the impact of a development alternative on a firm's locational decision becomes important when the results of our model show that, in a given year, demand exceeds supply for office space in the CBD.

a) Large Headquarters

We treat large headquarters separately from the small headquarters and non-headquarters firms in the same SIC codes. We do so for two reasons. First of all, we know that a large headquarters' locational decision is not as much a function of the type of business which characterizes its SIC code as it is of the fact that it performs headquarters activity. Thus, large headquarters make their locational choices in a similar manner irrespective of SIC code. Second, a large headquarters firm may have a different employment structure than a non-headquarters or small headquarters firm (which probably performs much non-headquarters activity) in a given SIC code. (This hypothesis will be tested using the EEOC data as described in Chapter B,

Section 1, Quantity and Types of Jobs). This is probably especially true of manufacturing SIC codes. If a large headquarters firm locates in an area, it will create a different mix of jobs than would a non-headquarters firm in that same industry. Since we are ultimately interested in deriving employment estimates from our analysis of firm locations, we must consider large headquarters firms' decisions separately.

Interviews with members of the real estate division of firms which have large headquarters in the CBD show that the locational decisions of a large headquarters firm is quite complex. A large headquarters is less sensitive to the type and quantity of available office space than to other macro-economic factors in choosing a location. It functions as an independent unit having an in-house professional staff and, therefore, does not need a CBD location. However, once it has a permanent location, it is unlikely to move. If it does move, it will probably be because of a desire to build its own building. Thus, for our analysis, we will assume that a large headquarters which is presently located in the CBD will not be forced out by a development constraint. Even a decision to build its own building out of the CBD could not be necessarily considered a result of a development constraint.

We have studied the location decision process of large headquarters firms when choosing a new location and have concluded that we will not lose important alternative development effects if we do not analyze the potential of attracting large headquarters firms which are not presently in the City.

This is true for two reasons. First, a large headquarters firm is influenced principally by macro-economic and personal factors in choosing a city for its location. A realtor gave us an interesting example of this fact. The example involves a large headquarters which is presently considering a San Francisco location. This firm does a considerable amount of business in a small town in North Carolina,

and the main factor in the firm's decision of whether to locate in San Francisco was the frequency of airplane service between San Francisco and the North Carolina town.

Second, the amount of movement of large headquarters between cities is very small. The expense of moving its facilities and personnel is prohibitive unless a firm has strong reasons for making that move, and as pointed out earlier, those reasons are not likely to be based on the conditions created by a development alternative. For the extreme case of scarce land available for development or limitation of space within one building, these headquarters firms can be grouped with all other firms for the analysis of development impact.

The following analysis of firm locational decisions, therefore, deals only with non-headquarters and small headquarters office firms. For this reason we have totaled all of the large headquarters office space in our sample by SIC code. (See Appendix A1-6). We will subtract those totals from the amount of CBD space occupied by the respective SIC code in our final analysis of the distribution of CBD office space by SIC code.

b) Firm Interactions

Our main discussion of firms' locational decisions centers around certain locational parameters. These parameters are affected by the conditions created by a given development alternative and are an important consideration in a firm's locational choice. However, the locational choice of many firms also depends upon the presence of client or customer firms. Therefore, a given development alternative will also indirectly affect the locational attraction for some firms by influencing the firms on whom they depend to stay or leave. This effect might be termed a "secondary" effect of a development alternative while recognizing that it is an important influence on many firms' decisions to remain in or leave the downtown or the City itself. A good example of a firm for which

this effect is extremely important is printing and publishing.[21]

To investigate the relative attraction between firms, we used an input-output analysis to determine the interactions which San Francisco firms experience with other firms of various types. Essentially, the analysis evaluates, sector by sector, the input needs from all sectors for a given change in outputs of any single sector. Input needs are assumed initially to be stable linear functions of output determined by production technology, stated as: $X_{ij} = a_{ij}\ x_{ij}$, where a_{ij} is the technical coefficient describing the amount of output of industry i required for a unit of output by industry j. In order to determine the amount of interaction among local firms, we modify these technical coefficients to reflect the fact that only part of a sector's input needs are satisfied through local purchase. (The reader can find a more complete description of input-output analysis in Isard, Methods of Regional Analysis, 1960).

The method which we used to develop local input-output coefficients and a matrix of gross flows among various sectors is often referred to as the "supply-demand pool technique." This method was initially outlined by Isard (1951), made explicit by Leontief (1953) and first applied to a particular region by Moore and Petersen (1955). Dr. Everard Lofting (1971) of the Mathematics and Computing Division at the Berkeley Lawrence Radiation Laboratory has recently used the method to develop a regional table for the San Francisco Bay Area as a whole. Essentially, what we did was to modify his table to include only San Francisco County.

In essence, the technique is as follows. For the geographic area in question (in our case, San Francisco City and County), estimate the gross dollar output of each business sector. Apply the matrix of national coefficients to these estimates to find demands by local firms for each sector's output. (The assumption here is that local "production techniques" are not significantly different from those

nation-wide). Then subtract these firm demands, and estimates of final demands of consumers and of government and for capital formation, from the gross outputs of the geographical area. Residuals are net exports (positive) or net imports (negative) of each sector's products. Algebraically, $X-AX-Y = E$, where X is an $m \times 1$ column vector of gross output for each m sectors, A is an $m \times m$ matrix of national technical coefficients with a_{ij} the requirement for good or service i to produce a unit of output j, Y is an $m \times 1$ vector of combined final demands, and E a vector of net imports or exports.

For those sectors yielding net exports (production larger than local demand), consider all interindustry demand to be met locally and set local coefficients $b_{kj} = a_{kj}$ for all j. That is, when a sector produces enough to meet local needs and exports, it is assumed that local firms meet all their needs from that sector by buying from local firms. Cross-hauling (some firms importing a good or service and others exporting it) is disregarded, although it in fact occurs.

For those sectors i requiring net imports (local production less than local demand), demand for locally produced goods or services must be brought into line with local supply by specifying how local buyers (firm or final demander) obtain something less than their total needs by local purchase. The particular assumption is that each demand sector gets locally the same reduced percentage of its total needs. To bring about balance, the percentage must be the same as the percentage local supply is of total local demand. In the local coefficient matrix B, $b_{ij} = (x_i / \sum_j a_{ij}\ x_{ij} + y_j)\ a_{ij}$ for all j. This assumption is unlikely to hold very well firm by firm or person by person, but seems reasonably realistic averaged for entire demand sectors. Of course, cross-hauling is again neglected (all local production assumed to be sold locally in import sectors), yielding an overestimate of demand satisfied locally to the extent cross-hauling in fact occurs.

The matrix of local coefficients and the modified column of final demands are formed such that local supply just equals demand, or exceeds it by some positive level of exports. Manipulating the matrix allows estimation of local input required (released) from any local sector for unit change in final demand in any other sector--change here most relevantly coming from the high-rise related arrival (departure) of some additional firm. Algebraically: $X = BX + Y + E$, and $X = (1 - B)^{-1}(Y + E)$. The ijth element of the inverted matrix gives change in local requirement of good or service i for unit change in final demand for good or service j.

Two changes were made in Lofting's model to make it useful for our purposes. First, his sectors were re-aggregated in order to correspond to two-digit SIC codes. Second, we scaled his estimates of gross outputs and final demands by these sectors to the San Francisco level. We used 1967 employment data and Bureau of the Census population and income data to do so.

We estimated local gross output by multiplying San Francisco's share of regional employment in each sector by the regional output total. Local consumer demands were estimated by multiplying regional demand by the City's share of regional population and by the ratio of San Francisco's mean income to the regional mean. Local demands from each sector for capital formation were estimated as being the same share of each sector's output as observed at the state level. Finally, we estimated local demands by federal, state, and local governments by determining San Francisco's share of regional demand. Percent of regional population was used as a surrogate for percent of government demands.

Given that we use the results of the analysis only to identify local sector interaction and not to derive exact levels of exchange, we did not feel it important to further refine our estimation procedures. Our firm locational analysis is not performed at a level precise enough to require this effort. The

coefficient and gross flows matrices which we derived appear to be logical when compared with other input-output tables and when considered in light of our knowledge of San Francisco economic activity.

c) Ranking of Firms

Because of the reasons stated in the discussion of locational parameters, we use desire for proximity to the CBD as a criterion for determining the order in which firms in various SIC codes will leave the CBD under a development constraint. We then use the input-output analysis and our specific sample of rent levels (see Appendix A1-4) in order to clarify firm locational priority rankings.

We have organized firms into three groups for purposes of discussion. The first is composed of those manufacturing SIC codes which have a declining growth rate in the City and which have no "economic" necessity to locate in the CBD. These firms, identified in Appendix A1-7, are in SIC codes 15, 17, 20, 25, 28, 32, 33, 34, 35, 36, 37, and 39. Appendix A1-4 shows that they are fairly sensitive to rent levels, and will be the first to leave.

The second group of firms which we will discuss are those which are in growing sectors of the economy, but who have only a small amount of employment in the City and office space in the CBD. As is evidenced in Appendix A1-6, these firms are in SIC codes 7, 8, 9, 10, 13, 22, 24, 26, 30, 31, 38, 40, and 46. Since there are very few CBD firms in each of these SIC codes, we will assume that those which are in the downtown have strong reasons for locating there. These reasons are likely to be independent of proximity to the CBD. These firms are, therefore, likely to be insensitive to the rising rent levels which would result from a constrained development alternative. We will, therefore, consider them to be among the last to leave. (Even if this assumption is wrong, it will not significantly affect our results since there are so few of these firm types in the CBD).

SIC codes 16, 23, and 29 have a large amount of office employment in the CBD and are considered to have strong reasons for being there as well. Appendix A1-6 shows that most of this employment is in large headquarters. These are treated independently of the non-headquarters as we explained above.

Finally, we come to the group of firms who have a significant level of expanding office employment in the CBD. We use the criterion of desire to be in the CBD in order to rank them in the order in which they would leave the CBD under constrained development.

In our final analysis the method by which we will displace these firms is the following. We first divide the remaining firms into two groups. Group One is composed of those firms which have a particularly high desire to locate in the CBD. Group Two consists of those who do not. These groups are distinct in that the firms in Group One need to be near each other as well as needing a central location. Those in Group Two function fairly independently.

First, we determine the excess demand for office space over and above that occupied by the declining manufacturing firms discussed above. We will then free as much of this space as is available from those firms in Group Two. This will be done in proportion to their desire to locate there. Thus, all of those firms in Group Two which have the weakest desire to locate in the CBD will not be forced to leave before those whose affinity for the CBD is stronger. If excess demand exceeds the floor space occupied by the Group Two firms, the same process will be applied to those in Group One. This method is appropriate in that for certain sectors, a balanced mix of interacting firms is one of the advantages of a CBD location.

The identification of the two groups and their relative attraction to the CBD (measured by the percentage of office floor space in a given SIC code which is found in the CBD) are presented in Table A1-4.

Table A1-4

Group One

SIC Code	Description	Percent of Space in CBD
67	Holding and investment companies	100.0
66	Combined real estate, insurance, etc.	97.8
62	Security, commodity brokers and services	96.6
63	Insurance carriers	93.8
81	Legal services	83.3
65	Real estate	81.6
44*	Water transportation	80.1
70	Hotels and other lodging places	80.0
64	Insurance agents, brokers, and services	78.6
73	Miscellaneous business services	69.0
60	Banking	68.8
47	Transportation services	68.3
61	Credit agencies other than banks	59.3
89	Miscellaneous services	57.3

Group Two

SIC Code	Description	Percent of Space in CBD
86	Nonprofit membership organizations	41.3
45	Transportation by air	35.4
50	Wholesale trade	33.8
82	Educational services	28.8
48	Communication	27.8
72	Personal services	23.9
27	Printing and publishing	22.2
80	Medical and other health services	19.8
79	Amusement and other recreation services	14.0
78	Motion pictures	12.4
49	Electric, gas and sanitary services	11.6

*This SIC code has a high ranking because of its desire to be near the water.

Those firms which are the first to leave the CBD are those which are most sensitive to rent levels. Appendix A1-4 shows that, in most cases, firms in those SIC codes which our tabulation shows to be among the last to leave pay high rents.

(c) Other Areas of the City

After analyzing the pressure on office space in the CBD, we will evaluate demand for office space in the other areas of the City. This analysis is conducted in the same manner as that for the CBD using similar data. A slight modification is made in that demand for space from firms forced to leave the CBD will be added to the demand for space in these areas. We will assume that all firms forced to leave the CBD will first attempt to find a location nearby. This assumption is substantiated by the gross flows table which resulted from the input-output analysis. Many of the firms which will be among the first to leave the CBD under constrained development have customers who will remain. SIC code 27 (printing and publishing) is a good example. In 1967 (the year for which our analysis is done), of the $237.5 million of gross output in SIC 27, approximately $52.6 million was demanded locally by SIC code 73 (business services) and $7 million by SIC 60 (banking). SIC 27 also has a high level of local interaction with SIC 50 (wholesale trade), and all local interaction totaled $137.8 million, or 58 percent of printing and publishing's total volume.

to suburbs see Foley's [illegible] census [illegible]

If those firms being forced out of the CBD and those other firms demanding space in areas outside the CBD cannot find suitable space within the City, they will leave the City.

(d) Industrial and Retail Space

Industrial, retail, and office firms rarely compete with each other for space. This competition occurs only when one type of space is replaced by another, and we will consider such competitive pressures when comparing one development alternative with another.

We are analyzing firm locations in order to determine its effect on the level of economic activity and employment. Since retail trades compete for the same type of space, are essentially one type of economic

activity, and the types of employment in the various retail SIC code categories are similar, it is valid to group retail trades together for our analytical purposes. Therefore, SIC groups 51 through 59 are considered together in our discussion of retail firm locations. (See Chapter A, Section 2 on Retail Trade and Personal Services for a description of our method).

The manufacturing sector, like the retail sector, will be treated as a whole. The fact that industrial firms are presently leaving the City at a rapid rate implies that there is not likely to be an excess demand for industrial space in the future. (See Appendix A1-7). (The only way in which a development alternative would cause a shortage of industrial space is by replacing a large amount of industrial space with office or retail space). We will assume that the industrial firms being replaced will leave the City entirely. We will note which industrial firms (by SIC code) will be pressured to leave under the conditions imposed by a development alternative and indicate the effects of their loss on employment.

Appendix A1-1

Sample Firms by SIC Classification

SIC Code	No. of Firms	No. of Office Headquarters	No. of Partial Industrial Firms	No. of Partial Industrial Headquarters	Total
7	2	--	--	--	2
8	1	--	--	--	1
9	1	--	--	--	1
10	1	2	--	--	3
11	--	--	--	--	--
12	--	--	--	--	--
13	2	3	--	--	5
14	--	--	--	--	--
15	10	3	3	1	17
16	8	2	1	--	11
17	9	1	19	--	29
19	--	--		--	--
20	16	9	38	5	68
21	--	--	--	--	--
22	1	2	2	1	6
23	10	1	4	4	19
24	6	2	4	--	12
25	1	1	9	4	15
26	4	2	6	--	12
27	68	2	26	2	98
28	12	2	6	5	25
29	2	--	1	1	4
30	1	--	1	2	4
31	1	--	1	--	2
32	3	--	2	--	5
33	4	--	9	2	15
34	8	1	20	5	34
35	9	--	13	6	28
36	2	2	8	1	13
37	1	--	2	2	5
38	5	3	2	--	10
39	8	1	6	1	16
40	25	2	--	--	27
41	1	1	--	--	2
42	9	--	48	4	61
44	17	7	3	1	28
45	45	--	--	--	45
46	1	--	--	--	1
47	107	7	7	--	121
48	45	--	2	--	47
49	12	--	3	--	15
50	309	15	178	7	509
60	105	8	3	--	116
61	66	5	--	--	71
62	169	3	--	--	172
63	23		--	--	23
64	386	8	--	--	394

SIC Code	No. of Firms	No. of Office Headquarters	No. of Partial Industrial Firms	No. of Partial Industrial Headquarters	Total
65	69	1	1	--	71
66	9	--	--	--	9
67	20	--	--	--	20
70	7	--	--	--	7
72	19	--	5	--	24
73	423	1	12	--	436
75	3	--	5	--	8
76	4	--	1	--	5
78	18	--	--	--	18
79	9	--	--	--	9
80	24	--	--	--	24
81	463	--	--	--	463
82	24	--	--	--	24
84	1	--	--	--	1
86	155	6	2	--	163
89	315	--	--	--	315

Source: Office Prospect File, Local Realtor

1967 Standard Industrial Classification Codes and Short Titles

SIC Code	Short Title
	A. Agriculture, Forestry, and Fisheries
07	Agriculture services and hunting
08	Forestry
09	Fisheries
	B. Mining
10	Metal Mining
11	Anthracite mining
12	Bitumiuous coal and lignite mining
13	Oil and gas extraction
14	Nonmetallic minerals, except fuels
	C. Contract Construction
15	General building contractors
16	Heavy construction contractors
17	Special trade contractors
	D. Manufacturing
19	Ordnance and accessories
20	Food and kindred products
21	Tobacco manufactures
22	Textile mill products
23	Apparel and other textile products
24	Lumber and wood products
25	Furniture and fixtures
26	Paper and allied products
27	Printing and publishing
28	Chemicals and allied products
29	Petroleum and coal products
30	Rubber and plastics products, n.e.c.
31	Leather and leather products
32	Stone, clay and glass products
33	Primary metal industries
34	Fabricated metal products
35	Machinery, except electrical
36	Electrical equipment and supplies
37	Transportation equipment
38	Instruments and related products
39	Miscellaneous manufacturing industries
	E. Transportation, Communication, Electric, Gas, and Sanitary Services
40	Railroads

SIC Code	Short Title
	E. Transportation, Communication, Electric, Gas, and Sanitary Services (cont.)
41	Local and interurban passenger transit
42	Trucking and warehousing
44	Water transportation
45	Transportation by air
46	Pipe line transportation
47	Transportation services
48	Communication
49	Electric, gas and sanitary services
	F. Wholesale and Retail Trade
50	Wholesale trade
	G. Finance, Insurance, and Real Estate
60	Banking
61	Credit agencies other than banks
62	Security, commodity brokers and services
63	Insurance carriers
64	Insurance agents, brokers, and service
65	Real Estate
66	Combined real estate insurance, etc.
67	Holding and other investment companies
	H. Services
70	Hotels and other lodging places
72	Personal services
73	Miscellaneous business services
75	Auto repair, services and garages
76	Miscellaneous repair services
78	Motion pictures
79	Amusement and recreation services, n.e.c.
80	Medical and other health services
81	Legal services
82	Educational services
84	Museums, botanical, zoological gardens
86	Nonprofit membership organizations
89	Miscellaneous services

Source: U.S. Department of Commerce, Bureau of the Census, County Business Patterns, Washington D.C., U.S. Government Printing Office.

Appendix A1-3

Study Areas

Appendix A1-4

Number of Firms by Rent Level

SIC Code	High Rent-Above Floor 25	High Rent-Floors 11-25	High Rent-Below Floor 11	Low Rent	Total Firms
7	--	--	--	--	--
8	--	--	--	--	--
9	--	--	--	--	--
10	--	--	1	--	1
11	--	--	--	--	--
12	--	--	--	--	--
13	--	--	--	2	2
14	--	--	--	--	--
15	--	--	1	--	1
16	--	1	1	2	4
17	--	--	--	1	1
19	--	--	--	--	--
20	2	2	1	1	6
21	--	--	--	--	--
22	--	--	--	--	--
23	--	--	1	--	1
24	--	1	--	--	1
25	--	--	--	--	--
26	--	--	2	--	2
27	--	--	1	--	1
28	1	2	1	--	4
29	1	--	1	--	2
30	--	--	--	--	--
31	--	--	--	--	--
32	--	--	--	2	2
33	--	--	--	--	--
34	--	1	--	4	5
35	--	1	--	1	2
36	1	--	1	--	2
37	--	--	--	--	--
38	--	--	--	2	2
39	--	--	--	--	--
40	1	1	--	--	2
41	--	1	--	--	1
42	--	--	1	--	1
44	5	4	1	2	12
45	--	--	2	2	4
46	--	--	--	--	--
47	2	5	2	6	15
48	1		1	3	5
49	--	1	1	1	3
50	9	19	9	17	54
60	6	1	3	3	13
61	3	2	1	5	11
62	38	12	14	10	74
63	--	--	1	6	7
64	15	20	36	34	105

Appendix A1-4 (cont.)

SIC Code	High Rent-Above Floor 25	High Rent-Floors 11-25	High Rent-Below Floor 11	Low Rent	Total Firms
65	11	4	2	3	20
66	2	--	--	1	3
67	4	1	1	1	7
70	2	--	--	--	2
72	--	--	--	--	--
73	22	29	23	15	89
75	--	1	--	--	1
76	--	--	--	--	--
78	--	1	--	--	1
79	--	--	2	--	2
80	1	2	--	--	3
81	25	21	30	40	116
82	--	--	3	--	3
84	--	--	--	--	--
86	2	2	4	4	12
89	15	10	9	9	43

Source: Office Prospect File, Local Realtor

Data from Sample of Firms
(space in square feet)

SIC Code	Office Floor Space in City	Office Floor Space in CBD	Partial-Industrial Office Space in CBD	Partial-Industrial Office Space in City	Mean Office Size	Number of Firms in CBD	Percent of Office Floor Space in CBD
7	5,300	5,300	--	--	2,650	2	100
8	1,000	1,000	--	--	1,000	1	100
9	1,000	1,000	--	--	1,000	1	100
10	18,000	18,000	--	--	9,000	2	100
11	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--
13	93,700	88,200	--	--	18,740	3	94.1
14	1,000	--	--	--	1,000	--	--
15	72,320	49,820	5,535	22,252	5,563	9	58.5
16	81,800	77,800	--	8,180	8,180	8	86.5
17	34,500	8,100	1,350	65,550	3,450	6	9.4
19	--	--	--	--	--	--	--
20	198,700	112,700	--	341,764	7,948	15	20.9
21	--	--	--	--	--	--	--
22	17,000	8,000	--	16,998	5,666	1	23.5
23	199,499	153,999	--	145,088	18,136	3	44.7
24	22,500	8,000	--	11,248	2,812	3	23.7
25	8,000	8,000	--	52,000	4,000	2	13.3
26	172,599	171,599	--	172,596	28,766	5	49.7
27	349,599	105,100	3,503	139,832	4,994	30	22.2
28	175,450	149,950	12,495	137,852	12,532	12	51.8
29	8,500	2,000	--	8,500	4,250	1	11.8
30	2,500	2,500	--	7,500	2,500	1	25.0
31	1,000	1,000	--	1,000	1,000	1	50.0
32	7,200	3,700	--	4,800	2,400	2	30.8
33	98,500	97,500	--	270,875	24,625	3	26.4
34	94,100	31,400	--	261,375	10,455	5	8.8
35	33,100	6,800	--	62,890	3,310	5	7.1
36	78,900	30,900	--	177,525	19,725	2	12.1
37	2,500	2,500	--	10,000	2,500	1	20.0
38	78,000	14,000	--	19,500	9,750	4	14.4
39	31,000	17,400	--	24,108	3,444	3	31.6
40	350,399	3,300	--	--	12,977	6	9.4
41	7,500	1,500	--	--	3,750	1	20.0
42	93,100	20,200	8,080	537,888	10,344	5	4.5
44	244,400	228,400	--	40,732	10,183	19	80.1
45	241,100	85,300	--	--	5,357	13	35.4
46	20,000	20,000	--	--	20,000	1	100
47	263,460	191,110	--	16,177	2,311	87	68.3
48	806,496	234,499	--	35,844	17,922	24	27.8
49	234,998	34,200	--	58,749	19,583	8	11.6
50	1,641,408	863,610	8,344	93,720	5,066	207	33.8

SIC Code	Office Floor Space in City	Office Floor Space in CBD	Partial-Industrial Office Space in CBD	Partial-Industrial Office Space in City	Mean Office Size	Number of Firms in CBD	Percent of Office Floor Space in CBD
60	1,853,843	1,290,694	19,264	49,215	16,405	67	68.8
61	303,270	179,970	--	--	4,271	37	59.3
62	862,253	833,053	--	--	5,013	164	96.6
63	129,900	121,900	--	--	5,647	20	93.8
64	2,705,109	2,125,068	--	--	6,865	330	78.6
65	169,570	140,370	--	2,422	2,422	56	81.6
66	44,842	43,842	--	--	4,982	8	97.8
67	83,300	83,300	--	--	4,165	20	100
70	7,500	6,000	--	--	1,071	5	80.0
72	35,820	10,820	--	9,425	1,885	8	23.9
73	1,343,720	882,290	--	38,028	3,169	293	63.9
75	6,600	1,000	--	11,000	2,200	1	5.7
76	6,500	3,000	--	1,625	1,625	3	36.9
78	44,500	5,500	--	--	2,472	3	12.4
79	5,166	6,500	--	--	5,166	5	14.0
80	69,060	13,660	--	--	2,877	9	19.8
81	1,308,275	1,090,100	--	--	2,819	349	83.3
82	128,420	36,970	--	--	5,350	8	28.8
84	3,000	3,000	--	--	3,000	1	100
86	684,665	286,565	--	8,504	4,252	65	41.3
89	1,305,639	747,550	--	--	4,144	205	57.3

Source: Office Prospect File, Local Realtor.

Office Floor Space Calculations and Data

SIC Code	Total City Employment[1]	Office Employment in City	Office Employment in CBD	Calculated Office Floor Space in CBD (in square feet)	Large Headquarters Floor Space in CBD (in square feet)[2]
7	3,279	133	133	26,663	--
8	--	--	--	--	--
9	--	--	--	--	--
10	57	--	--	--	--
11	--	--	--	--	--
12	--	--	--	--	--
13	689	110	103	20,649	87,200
14	1,234	--	--	--	--
15	20,277	813	475	95,227	10,600
16	15,411	1,367	1,181	236,765	51,000
17	27,317	1,495	141	28,267	--
19	--	--	--	--	--
20	38,884	4,577	954	191,256	88,000
21	--	--	--	--	--
22	789	174	40	8,019	--
23	9,570	2,995	1,338	268,240	99,999
24	1,681	98	23	4,611	--
25	4,091	424	56	11,226	--
26	8,639	651	323	64,754	65,000
27	18,334	3,376	749	150,158	--
28	1,727	621	321	64,353	--
29	3,619	1,302	153	306,730	300,500
30	244	87	21	4,210	--
31	283	101	50	10,023	--
32	512	184	56	11,226	--
33	627	225	59	11,828	--
34	5,089	1,832	161	32,277	--
35	1,739	626	44	8,821	--
36	827	297	35	7,016	19,000
37	2,245	808	161	32,277	--
38	414	149	21	4,210	--
39	--	--	--	--	--
40	--	--	--	--	--
41	3,829	1,638	327	65,556	82,000
42	6,249	2,674	119	23,856	--
44	7,614	3,258	2,609	523,049	35,000
45	2,685	1,149	406	81,394	--
46	--	--	--	--	--
47	2,925	1,251	854	171,208	20,000
48	17,190	7,357	2,048	410,580	--
49	7,070	3,025	352	70,568	--
50	38,147	14,762	4,991	1,000,590	21,000

SIC Code	Total City Employment	Office Employment in City	Office Employment in CBD	Calculated Office Floor Space in CBD (in square feet)	Large Headquarters Floor Space in CBD (in square feet)
60	22,863	17,192	11,834	2,372,467	1,362,600
61	3,759	2,826	1,677	336,203	20,000
62	5,264	3,958	3,823	766,430	29,000
63	18,894	14,208	13,332	2,672,783	--
64	5,063	3,807	2,990	599,431	70,000
65	6,598	4,961	4,048	811,538	--
66	193	145	141	28,267	--
67	532	400	400	80,191	--
70	9,098	5,240	4,191	840,207	--
72	5,276	3,038	726	145,547	--
73	19,015	10,952	6,993	1,401,948	--
75	4,091	2,356	133	26,663	--
76	917	528	194	38,892	--
78	2,320	1,336	165	33,079	--
79	2,938	1,692	236	47,313	--
80	17,558	10,113	2,000	400,957	--
81	4,445	2,560	2,133	427,621	--
82	1,392	801	230	46,110	--
84	--	--	--	--	--
86	7,455	4,294	1,775	355,850	38,000
89	8,884	5,117	2,929	587,202	--

(1) The fact that employment in SIC 40 is not covered by our SIC employment data does not hinder our analysis in that the office coefficient for SIC 40 is 0.

(2) The fact that there is more headquarters space than calculated office space is due to the "proxy" office coefficient used.

Sources: 1. California Department of Human Resources Development, California Employment and Payrolls, September, 1971.

2. Office prospect file, local realtor.

Employment Growth Rates

SIC Code	Growth Rates in Percent	R^2
7	5.02	.677
8	0.00	--
9	0.00	--
10	0.00	--
11	0.00	--
12	0.00	--
13	146.10	.832
14	0.00	--
15	-3.55	.788
16	6.40	.808
17	-3.55	.759
19	0.00	--
20	-1.83	.732
21	0.00	--
22	71.36	.340
23	1.83	.885
24	130.30	.761
25	-7.16	.757
26	6.07	.138
27	-2.60	.816
28	-0.23	.075
29	1.90	.516
30	40.98	.133
31	132.44	.776
32	-14.01	.824
33	-9.75	.845
34	-2.23	.616
35	-6.18	.849
36	-4.00	.614
37	-3.09	.162
38	39.04	.131
39	-53.21	.588
40	0.00	--
41	-0.08	.027
42	0.31	.048
44	-3.75	.378
45	7.20	.821
46	0.00	--
47	-32.36	.096
48	5.44	.947
49	2.76	.884
50	-1.80	.892
60	5.84	.976
61	3.95	.776
62	7.66	.764

SIC Code	Growth Rates in Percent	R^2
63	1.30	.695
64	-0.34	.162
65	1.59	.860
66	-7.30	.957
67	3.86	.157
70	1.95	.588
72	-1.62	.469
73	3.79	.814
75	3.35	.918
76	-1.06	.353
78	2.54	.586
79	-0.77	.084
80	4.83	.977
81	6.03	.995
82	9.22	.927
84	0.00	--
86	2.62	.918
89	6.54	.940

Source: California Department of Human Resources Development, California Employment and Payrolls, September, annual.

Firms Displaced by High-Rises

SIC Code	Percent of Firms Relocating in CBD	Number of Firms
7	--	--
8	--	--
9	--	--
10	--	--
11	--	--
12	--	--
13	--	--
14	100	1
15	100	2
16	--	--
17	--	--
19	--	--
20	37.5	8
21	--	--
22	100	1
23	--	--
24	33	3
25	--	--
26	--	--
27	25	12
28	0	3
29	--	--
30	--	--
31	--	--
32	--	--
33	--	--
34	100	1
35	0	3
36	--	--
37	--	--
38	--	--
39	0	1
40	0	2
41	--	--
42	--	--
44	0	1
45	--	--
46	--	--
47	87.5	8
48	--	--
49	--	--
50	43.5	62
60	100	1
61	--	--
62	--	--
63	100	2
64	75	12
65	33	6

SIC Code	Percent of Firms Relocating in CBD	Number of Firms
66	--	--
67	66	6
70	50	2
72	27.3	11
74	--	--
75	50	4
76	0	1
78	--	--
79	--	--
80	100	1
81	75	20
82	--	--
84	--	--
86	57	7
89	36	11
	45	247

Sources: 1) **Polk and Company,** Polk's San Francisco City Directory, Monterey Park, California, annual.

2) **San Francisco Tax Collector**

A. BUSINESS ACTIVITY (continued)

2. Retail Trade and Personal Services

Alternative levels of high-rise building development can be expected to affect San Francisco retail sales and services in three separable ways. First, workers in commercial high-rise buildings make purchases during and following their work day near their place of employment. Second, the demographic characteristics and purchase choices and levels of San Francisco residents are subject to the influences of high-rises. Third, quality-of-life impacts of development alternatives affect the amount of in-city spending by residents and non-residents alike.

Since direct sales of goods and services are of substantial magnitude (State Board of Equalization, 1970, reports San Francisco retail sales of $1,382 billion) and generate significant employment and earnings, it is worthwhile to develop estimates of consumption for each of the above groups. High-rise effects on sales to firms and tourists are considered separately in the discussions on firm locations and interactions and tourism.

We will estimate purchases by commuters using a survey developed for that purpose. Purchases by San Francisco residents will be computed using Bureau of Labor Statistics data. Finally, we will derive qualitative estimates of the impact of quality-of-life changes from past surveys and from our own survey.

a. Spending by Commuters at Place of Work

San Francisco receives a daily influx of about 200,000 commuters (U.S. Census, Social Characteristics, 1970). Many of these, along with many more San Francisco residents, work in firms presently located in high-rises, firms with the potential to locate in high-rises depending on high-rise activity, or firms with the potential to be driven out or replaced through various development alternatives. We are analyzing commuters' spending separately from San Francisco residents' spending because all workers divide their purchases mainly between their place of residence and place of work, and their sensitivity to the attractions and nuisances at either place is extremely important in determining how they will distribute their purchases. For workers residing outside of San

Francisco (i.e., commuters), we will study how the attractiveness of the San Francisco market will influence their purchases in the city. To determine the nature of these commuter's San Francisco expenditures, we designed an interview method and tested it in this phase of the study.

(1) Test of the Method

In order to determine the effects of employment distribution on changes on retail spending, we will conduct a survey of commuter expenditures near their place of work. The results of a pilot survey completed in Phase 1-B indicated that it will be possible to calculate this effect (a copy of the questionnaire is presented in Appendix A2-1), and we conclude that application of the method is feasible.

The survey was conducted in two stages. First, we sent a copy of a preliminary questionnaire to the heads of fourteen San Francisco firms. We asked for and received suggestions for additions and corrections and revised the questionnaire accordingly. Secondly, we distributed copies of the improved questionnaire to a random sample of employees at five of these firms. Both the response rate to the questionnaire as a whole and the responses to the particular questions indicate that our method will yield useful results.

(a) Return of Questionnaires

The response rate to the questionnaire was quite high, and the response rate was consistently high for all of the firm types to which the questionnaire was sent. (For our questionnaire test, law firms, architectural firms, holding companies, and banks were included[1]).

Only four of the 193 questionnaires returned were unusable. Two of these were residents of non-California cities (and are probably not regular commuters), and two failed to fill in their occupations. All of the respondents were office workers (i.e., professional, managerial, or clerical). In Phase III we will make a special effort to cover the non-office occupations.

(b) Responses to Individual Questions

From the responses to the various questions on the pilot questionnaire we have identified those questions which respondents had difficulty in understanding.

In the first section on occupation, most respondents were able to choose one occupational type, but a few felt that they should check more than one in order to convey their perception of their occupations. In order to correlate this data with employment data from other parts of the study, in Phase III we will ask people who check two or more occupations and those who check "other" to specify their particular occupation. We will then type their occupations according to the Bureau of Labor Statistic's classifications which were used on the questionnaire.

In the second section, which details socio-economic characteristics of the workers, we identified problems with several questions. The questions on income and length of time at present occupation will be dropped from the questionnaire. We consider spending differences by income to be accounted for by spending differences by occupation, so income is not required in our analysis.[2]

The "age" and "sex" questions were answered by all respondents and will be used in order to calculate spending by employees of various ages and sexes within a given occupation.

We will delete the questions on number of family members and whether or not the respondent is a head of household from the final survey because our development-related shifts in employment will not be expressed in these terms.

The responses to the question in the third section of the questionnaire on distribution and level of expenditures indicate that we will be able to obtain estimates of spending by type of expenditure. We are attempting to obtain a dollar estimate of spending in San Francisco which is caused by the fact that a person works

in the city. Although this question expresses a difficult concept, most people understood the question and responded with reasonable estimates. The fact that the annual average spending for all occupations is \$2537.71 or 14.6% of the average annual income of a respondent (derived from those who stated their incomes) makes the estimate appear reasonable. (See Appendix 2-2) After making many changes in expenditure categories between the first questionnaire and the one actually sent to employees, we became satisfied with the list of categories. We plan to make only three changes for the Phase III questionnaire. We will add an "entertainment" category to the list to provide an estimate of spending on movies, nightclubs, and similar activities. Second, we will combine the "sporting goods and toys" category with the "recreational goods" category because of their similarity. Finally, we will separate public transportation into "intercity" and "intracity" public transportation to provide separate information for commute services and the Muni services.

(2) Example of Results Expected from the Method

From the relationships between spending and occupation derived from our survey, we will be able to calculate the change in spending for development-caused changes in the composition of commuter employment of the city. The commuter employment changes will be expressed in terms of occupation, sex and in some cases race. The commuter data by race is statistically significant only for some occupations. The following is a sample of the type of analysis which will be done.

The basic concept is illustrated in a simple example, showing the impact of a hypothetical development alternative on only one commodity, using changes in only two occupations. Second, we will show how this example can be expanded to a full range of goods and services consumption for any development alternative.

For example, if a particular development alternative were to add one more commuting professional worker to and subtract one commuting clerical worker from the downtown area, then we know that spending in San Francisco restaurants and bars would increase

by the added expenditures of the professional worker and decrease by the lost expenditures of the clerical worker. From the results of our preliminary questionnaire, we would expect the professional to spend \$2.17/day on restaurants and bars in San Francisco and the clerical worker to stop spending \$1.52/day on restaurants and bars in San Francisco. The net change in spending in restaurants and bars in San Francisco is an increase of \$.65/day.

This example can easily be expanded to include three occupations and all goods and services. Suppose that a particular development alternative were to provide 1000 more professional jobs and 1000 more clerical jobs, while removing 500 managerial jobs, all for commuters; the net effect on total spending for all goods and services in San Francisco might be an increase of more than \$4 million based on our pilot survey. This figure is determined by multiplying changes in each occupation by the spending for that occupation on each type of good and service, then summing the changes in spending for all goods and services to arrive at a net dollar amount. (See Appendix A2-3 for the calculations showing the derivation of the \$4 million estimate).

The mathematic representation of this calculation is as follows: Vector A_i is the spending of occupation A on good i. Vectors B_i and C_i are similar vectors for occupations B and C. If a development alternative were to change San Francisco employment in occupations A, B, and C by a, b, and c, respectively, then the total change in spending for each good i = $aA_i + bB_i + cC_i = D_i$. The total change in spending for goods 1 through n =

$$\sum_{i=1}^{n} D_i$$

Once again, it should be noted that although the small survey conducted in this phase of the study showed some very interesting results, it was only a test. Our analysis of the commuter-consumer purchases for alternative developments will be based upon a larger survey to be conducted in Phase III.

b. Direct Sales Changes from High-Rise Related Changes in Demography

The types and amounts of resident consumer purchases in

San Francisco will no doubt be affected by changes in resident characteristics resulting from various development patterns. A straightforward method to estimate those sales changes, given demographic changes, is available using Bureau of Labor Statistics Consumer Expenditures and Income data.

The Bureau data, compiled by survey for each of numerous major cities, provides dollar mean consumer expenditure by detailed type, for consumer households classified by family income, family size, age of family head, occupation of head, housing tenure, education of head, race, family type, and number of full-time earners along with 18 cross-classifications of these characteristics. Once any major demographic changes along any of these dimensions or combinations are identified as part of future development impacts, estimates of net change in expenditure by type will be directly obtained by multiplying mean purchases for appropriate population cells by the net change in persons in that cell.

The 1970 BLS survey results are not available and probably will not be available until after completion of our study. Therefore, we have updated 1961 data using The Consumer Price Index. (See Appendix A2-4 for the method of updating the data). The method for analyzing this impact is fully developed and has been tested. We anticipate no problems in applying either the updated 1961 BLS data or the 1970 BLS data when it becomes available.

c. Direct Sales Changes from High-Rise Related Changes in Environment

Changes in direct sales will vary with high-rise related changes in quality of life. All shopper groups, and particularly non-residents employed elsewhere, can be expected to vary their expenditures in San Francisco and among its neighborhoods and shopping centers with changes in the quality of the local environment. And development alternatives do affect many variables which influence purchase levels.

(1) Test of the Method

In order to provide qualitative indications of the impact of changes in environmental characteristics on spending, we have attempted to determine shopper ranking of concerns in two ways. The first is by reviewing existing surveys. Second, in our questionnaire we have asked respondents to relate environ-

mental factors to their shopping habits.

(a) Review of Past Surveys

The Storun-Rosenberg study consisted of a few interviews of store managers and presidents in the downtown retail district. Eight people were asked questions concerning the problems and future of retailing in downtown San Francisco and the buying habits and demographic characteristics of customers. The respondents cited crime and personal safety, inadequate and expensive parking facilities, BART construction, loitering, "undesirables", and pornographic movies and bookshops as their perception of the most pressing problems.[3]

Karen S. Ahn studied the shopping habits of Bank of America employees in March, 1971. She distributed over 9,000 questionnaires and received 3925 responses from employees in both San Francisco and San Mateo counties. The advantages of the downtown retail district were described as the variety of stores, its convenient location for San Francisco residents and workers, the "convenient, if noisy, bus system", and the selection of novelties, books and gifts. When asked "How could downtown be improved?", people listed three major criticisms: inadequate and expensive parking facilities, congested motor and pedestrian traffic, and the polluted environment.[4]

The San Francisco Chamber of Commerce's Ad Hoc Committee concerning the Downtown Retail District evaluated suggestions for the improvement of the downtown retail district. The committee report, signed by Feerst and Fiorito and dated March, 1971, ranked various proposals according to contribution to solution of the problem, feasibility of implementation, and cost. The committee's suggestions included more police, more parking, and removing cars from the downtown area.[5]

In 1968, Alessandro Baccari and Associates surveyed 1,000 merchants in the outlying districts of San Francisco. The questions asked are of limited relevance because most deal with factors which are not related to various development alternatives. As in every other survey, however, parking was mentioned as a problem.[6]

The consensus of these surveys of merchant and shopper opinion seems to be that parking is a problem throughout most of the City. This is a concern of every survey and, as such, we regard it as a serious deterrent to shopping in San Francisco for those who have a choice.

A second factor which is mentioned in most of the surveys is concern for personal safety, i.e., the threat of crime.

The third commonly mentioned concern is traffic congestion. We consider this problem, like that of parking, to be a serious deterrent to shopping in San Francisco.

(b) Survey Method

1) Purpose

For several reasons, we have decided to use our own questionnaire to supplement the data provided from the above surveys. First, the most recent of the surveys was made almost two years ago, so we want to update the responses. Second, only one of the surveys was directed to retail customers; the others were directed to merchants. Third, none of the surveys asked about all of the factors which might influence shoppers' location choices. None asked about such influences as air pollution or noise, for example. Fourth, because we wanted to develop a questionnaire to determine commuter spending in San Francisco, and the marginal cost of adding questions concerning the shopping environment was small, we asked a series of questions regarding the shopping environment and its influence on retail spending. (See Appendix A2-1).

Our general purpose in this section of the questionnaire is to try to identify what secondary influences shoppers consider in their decision of where to shop. In the third phase of this study we will analyze the responses with the objective of relating shopper concerns to various development alternatives.

More specifically, we will seek to discover the importance to shoppers of several factors which are related to development. We want to know whether shoppers presently perceive any of these factors as "good" enough or "bad" enough to influence their current shopping patterns.

2) Interpretation of Questions and Responses

An analysis of each of the questions and the pilot responses shows that the type of questions

asked will allow us to measure influences on the shopping environment. The results of the tabulation of thirty-eight preliminary questionnaires shows that our results are consistent with previous surveys and that we are able to obtain good responses to environmental questions without confusing the respondent. It should be recognized, however, that the compiled results of the survey are based on only a small sample. Therefore, they can only be used as an indication of the results that we might expect in the final survey.

In section IV.A of the questionnaire, we asked whether the present state of any factors has already caused the person interviewed to decrease his shopping in downtown San Francisco. By comparing the frequency of responses among the factors, we can determine which factors are perceived as being the most disparaging relative to the others. The fact that a person would check a response at all indicates two things: first, that the factor is important enough to him to influence his shopping patterns; second, that he perceives the condition of the factor as presently inhibiting his preferred shopping patterns.

We ask in section IV.B of the questionnaire if any factors would cause the person to decrease his shopping in downtown San Francisco. From the distribution of responses among factors, we can determine the importance of each factor relative to the others. In checking a factor, a respondent indicates that it is important enough to him to be a potential influence on his behavior.

In section IV.A, over one-half of the thirty-eight respondents indicated that traffic congestion (twenty-two responses) and insufficient convenient parking (twenty) had caused them to decrease their shopping in downtown San Francisco. People were concerned next about public transportation (ten) and sidewalk congestion (eight). No other factor was the cause of decreased shopping for more than three people.

When we asked which factors would cause people to decrease their shopping downtown if these

factors were to worsen, traffic (nineteen) and parking (twenty) were again the most frequently cited. As in the previous question, over twenty-five percent of the respondents mentioned sidewalk congestion (eleven) and public transportation (eleven). Also, over twenty-five percent checked the "threat of crime" (twelve). The fact that only five percent of the respondents checked this factor as presently deterring shopping may indicate that the threat of crime is a factor of serious concern to shoppers, but that it is not yet a problem.

A group of environmental factors was the next most frequently checked in response to question IV.B. Air pollution (five), traffic noise(four), construction noise (five), windiness at street level (five), and decrease in open space (five) were all checked by more than ten percent of the respondents. It was not the same group of people who checked all of these factors, however. Fifteen people checked one or more of this group, indicating that their shopping habits had some sensitivity to the environmental conditions.

Sections IV.C and IV.D of the questionnaire are the same as sections IV.A and IV.B except that we are trying to identify factors with a positive influence on shopping. We are using the questions in section IV.C to identify any factors which presently have a positive influence on shopping in the downtown. Section IV.D is included to identify and rank factors which have a potential positive influence on shopping.

In question IV.C we asked respondents if any factor had caused them to increase their shopping in downtown San Francisco. The only factors checked by at least ten percent of the respondents were the two positively-phrased high-rise questions: the general visual appearance of high-rise buildings (four) and the impressive size and scale of downtown buildings (six). All four respondents who checked the former also checked the latter, so there are six people who checked one or both of these factors.

We asked in question IV.D which factors would increase shopping in downtown San Francisco if

they were to improve. Once again, parking (twenty-three) and traffic (twenty-one) were the most frequently cited. Many people seem willing to use a more efficient system of public transportation. Fifty percent of the respondents (nineteen) checked that as a factor which would increase their shopping in the downtown. Factors mentioned by at least ten percent of the respondents were less sidewalk congestion (nine), less air pollution (six), an increase in open space (six), and a lower threat of crime (four).

Finally, we asked people to rank the three most important factors in question IV.E. In order to tabulate these rankings, we assigned three points to every first place number, two points to every second, and one point to every third. Once again, parking is the first concern of our sample group with twenty-eight first, second, or third place choices and sixty-eight points. Traffic congestion was a close second, with twenty-six total choices and fifty-five points. Third was a concern for the efficiency of public transportation with twelve choices and twenty-five points. The almost universal concern for the transportation system is demonstrated by the fact that thirty-five of the thirty-eight respondents checked at least one of the above three factors.

There were no other factors which were checked by more than twenty percent of the respondents. Sidewalk congestion was the next most frequently checked, with seven responses and fifteen points. The remaining factors were each checked at least once but none more than five times, indicating that none evokes the strong reaction that the transportation problem does.

We are certainly not surprised with the great concern for transportation. Our findings simply reaffirm the findings of several past surveys. In this survey, however, people have stated that their concern is great enough to influence present and/or future shopping behavior. The implication of this is that any development alternative which leads to a worsening of the downtown transportation system will discourage shoppers from purchasing goods and services there. On the other hand, any development alternative which would improve the transportation

situation downtown would encourage shopping in the downtown.

The responses indicate that the threat of crime is not presently a major deterrent to downtown shopping. If the threat were to increase, however, it could begin to influence people's shopping habits.

Similarly, the set of environmental factors is not presently deterring many people from downtown shopping. However, people are concerned enough to indicate that they would decrease their shopping downtown if these factors were to deteriorate further. Air pollution, traffic noise, construction noise, windiness at street level, and open space may also become more important in influencing shopping patterns as the general level of environmental consciousness is raised.

The questions directly asking for a reaction to high-rise buildings (general visual appearance and size and scale of buildings) are of marginal importance. The size and scale of buildings was ranked last out of twelve choices in question IV.E. Only one person ranked it among his top three choices and that was third. Given the fact that raising this issue directly may decrease the objectivity of the respondents, we feel that the potential benefits from asking this question are not worth the problems it creates.

These analyses of our very small survey are offered here principally to indicate the interesting response patterns we obtained. People were able to answer the questions easily and even showed consistency in their responses. We do not propose to use the results of only this small survey to base our ultimate impact analysis. Its purpose was to validate the method and questionnaire format. In Phase III of this study a similar but much larger study will be conducted, and it will form the principal basis of our alternative development impact evaluation.

3) Revision of the Questionnaire

Our own analysis and the comments of others indicate several aspects of the questionnaire need to be revised. First, we should add more explanatory

material to introduce the environmental section. Confusion existed in that the financial questions of section III are directed to commuters and their spending in the downtown area, whereas the questions of section IV are directed to both commuters and San Francisco residents. An additional source of confusion came from the fact that we are asking about factors which have only a secondary influence on shopping. Some respondents did not understand why we did not include the more important factors (such as store proximity and service) as choices in the questionnaire as well. We must either explain the omission more clearly or include the more important factors in the choice list, even though we are seeking information only on the secondary influences.

Second, a source of bias may exist in sections IV.A through IV.D if respondents feel that they must check at least one of the factors listed. Therefore, we will provide a space for "none of the above" in these sections.

Third, we will either rephrase or eliminate those questions which directly raise the issue of high-rises. Apparently, high-rise buildings themselves are of little direct influence on shoppers, and the questions may only serve to elicit unnecessary emotional responses from the respondents.

In general, most responses were complete and without indication of confusion. We feel that the questionnaire and interview method has considerable strength and can be effectively used to yield an indication of the factors which either do or will influence the attraction of the downtown as a shopping area in the future. In other sections of this study, we will show how many of these factors are directly affected by development intensity, and therefore, we will indicate how the relative shopping attraction will vary with the alternative development plans to be specified in Phase II.

This questionnaire plays an important part in our study of high-rise buildings in San Francisco. Your responses will help us greatly to determine the extent to which individuals purchase goods and services near their place of work. Your cooperation is greatly appreciated.

I. Please check the description which most closely indicates your present occupation.

A. Professional and technical ______________________
For example: Engineers, scientists, technicians, physicians, teachers, social scientist, lawyer, architect, etc.

B. Manager, official, proprietor ______________________
For example: Office manager, store manager, purchasing agent, etc.

C. Office and clerical ______________________
For example: Stenographer, secretary, typist, office machine operator, bank teller or cashier, switchboard operator, clerk, etc.

D. Sales worker ______________________
For example: Salesman, sales clerk, etc.

E. Craftsman and foreman ______________________
For example: Construction craftsman, metalworking, printing tradesman, mechanic, repairman, etc.

F. Operative and semi-skilled ______________________
For example: Driver, delivery man, semi-skilled metalworking, semi-skilled textile worker, etc.

G. Service worker ______________________
For example: Policeman, fireman, food service, household service, practical nurse, custodian, etc.

H. Laborer ______________________

I. Other (please specify) ______________________

II. We are also interested in the following information:

A. Years at present occupation ______________

B. Age ______________________

C. Sex ______________________

D. Race (optional) ______________________

E. City of residence ______________________

F. Annual income before taxes (optional) _______

G. Number of members in your family __________

H. Head __________ or non-head _______of family

III. Many workers purchase good and services near their workplace rather than near their residence because it is more convenient to do so. For each of the following categories, please estimate the purchases you make downtown which you would spend elsewhere if you worked near your residence. For example, you may spend $1.50 per day on restaurants and bars downtown which you would spend elsewhere if you worked elsewhere.

A. Restaurants, bars, cafes (daily) $__________

B. Grocery stores (weekly) $________________

C. Household furnishings and appliances excluding TV's, radios, and stereos (yearly) $____________________

D. Clothing, footwear, jewelry, accessories and tailoring (monthly) $__________________________

E. Laundry, shoe repair, etc. (monthly) $_______

F. Automobile purchase (yearly) $____________

G. Auto service, maintenance and parking (monthly) $__________________________

H. Auto and truck rental (yearly) $___________

I. Public transportation (monthly) $__________

J. Medical care - goods (drugs, prescriptions, eyeglasses, etc.) (monthly) $__________________________

K. Medical care - services (physicians, etc.) (monthly) $__________________________

L. Personal care - goods (cosmetics, shampoo, etc.) (monthly) $__________________________

M. Personal care - services (barbers, beauticians, etc.) (monthly) $__________________________

N. Recreational goods (TV, stereo, radio, camera) (yearly) $___________________________

O. Sporting goods and toys (monthly) $_________

P. Books, magazines, and newspapers (weekly) $______

Q. Florists (monthly) $______

R. Tobacco products (weekly) $______

S. Alcoholic beverages to take away (weekly) $______

T. Legal services (yearly) $______

U. Other (please specify) ______

V. What proportion of your financial services do you obtain downtown?
   - banking ______%
   - insurance ______%
   - stockbroker ______%

IV. Finally, we are interested in knowing your views regarding the pleasantness or unpleasantness of shopping in downtown San Francisco, apart from the availability of goods and services.

A. Have any factors caused you to decrease your shopping in downtown San Francisco? (Please check).

_____traffic congestion

_____sidewalk congestion

_____slow public transportation

_____poor street maintenance

_____air pollution

_____noise from traffic

_____noise from construction

_____windiness at street level

_____insufficient convenient parking

_____threat of crime

_____general visual appearance of high-rise buildings

_____shadows cast by big buildings

_____increase in size and scale of downtown buildings

_____decrease in downtown open space

B. Would any factors cause you to decrease your shopping in downtown San Francisco if they were to worsen? (Please check).

_____traffic congestion

_____sidewalk congestion

_____slow public transportation

_____poor street maintenance

_____insufficient convenient parking

_____threat of crime

_____general visual appearance of high-rise buildings

_____air pollution

_____noise from traffic

_____noise from construction

_____windiness at street level

_____shadows cast by big buildings

_____increase in size and scale of downtown buildings

_____decrease in downtown open space

C. Have any factors caused you to increase your shopping in downtown San Francisco? (Please check).

_____fast public transportation

_____ample convenient parking

_____crowds and bustle

_____general visual appearance of high-rise buildings

_____impressive size and scale of downtown buildings

_____low threat of crime

_____other (please specify) ______________________________

____

D. Would any factors cause you to increase your shopping in downtown San Francisco if they were to improve? (Please check).

_____efficiency of public transportation

_____ample convenient parking

_____less vehicle traffic

_____less sidewalk congestion

_____lower threat of crime

_____better maintenance of streets

_____less air pollution

_____increase in downtown open space

_____reduction in noise

_____other (please explain)

____

E. Which three factors do you consider the most important in determining where you do your shopping, apart from the availability of goods and services? (Please number 1, 2, and 3 in order of their importance to you).

_____traffic congestion

_____sidewalk congestion

_____availability of convenient parking

_____efficiency of public transportation

_____maintenance of streets

_____windiness at street level

_____size and scale of buildings

_____availability of open space

_____air pollution

_____threat of crime

_____ noise

_____ proportion of shade and sunlight at street level

_____ other (please explain) ______________________________

____

THANK YOU FOR YOUR COOPERATION.

Annual Spending by Occupation, from Preliminary Questionnaires

Category	Description	Managers (6)	Professionals (22)	Clerical (10)	Average (38)
A	Restaurants, bars, cafes	694.20	564.20	395.20	538.20
B	Groceries	---	32.76	148.20	57.72
C	Household furnishings	83.33	101.13	21.50	77.36
D	Clothing and accessories	259.92	932.64	782.40	786.84
E	Laundry, shoe repair	3.00	4.32	17.40	7.44
F	Auto purchase	250.00	171.13	103.20	165.70
G	Auto service	320.04	221.40	228.00	238.68
H	Auto rental	---	37.27	120.50	53.28
I	Public transportation	90.00	118.80	166.80	126.84
J	Medical care-goods	81.96	42.48	66.00	54.84
K	Medical care-services	93.96	45.24	57.60	56.16
L	Personal care-goods	36.00	27.72	44.40	33.36
M	Personal care-services	57.96	45.72	160.80	77.88
N	Recreational goods	---	24.09	19.20	18.99
O	Sporting goods and toys	20.04	49.08	20.40	36.84
P	Books, magazines, and newspapers	52.00	47.32	93.60	59.80
Q	Florists	9.96	11.64	7.20	10.20
R	Tobacco products	112.84	79.04	54.60	77.48
S	Alcoholic beverages to go	52.00	58.76	2.60	42.64
T	Legal services	---	6.81	---	3.94
U	Other	44.00	6.81	10.00	13.52
	TOTAL	2261.21	2628.36	2519.60	2537.71
	MEAN INCOME	18,000	21,000	8,866	17,348
Annual spending/Annual Income		12.5%	12.5%	28.4%	14.6%

Source: Compilation of 38 preliminary questionnaires.

Appendix A2-3

Example of the Effect of a Change in Employment Characteristics on Retail Sales
(In thousands)

Category	Description	Professionals	Clerical	Managerial	Net
A*	Restaurants, bars, cafes	564.20	395.20	-347.10	612.30
B	Groceries	32.76	148.20	- 0.00	180.96
C	Household furnishings	101.13	21.50	- 41.67	80.96
D	Clothing and accessories	932.64	782.40	-129.96	1585.08
E	Laundry, shoe repair	4.32	17.40	- 1.50	20.22
F	Auto purchase	171.13	103.20	-125.00	149.33
G	Auto service	221.40	228.00	-160.02	289.38
H	Auto rental	37.27	120.50	- 0.00	157.77
I	Public transportation	118.80	166.80	- 45.00	240.60
J	Medical care-goods	42.48	66.00	- 40.98	67.50
K	Medical care-services	45.24	57.60	- 46.98	55.86
L	Personal care-goods	27.72	44.40	- 18.00	54.12
M	Personal care-services	45.72	160.80	- 28.98	177.54
N	Recreational goods	24.09	19.20	- 0.00	43.29
O	Sporting goods and toys	49.08	20.40	- 10.02	59.46
P	Books, magazines, and newspapers	47.32	93.60	- 26.00	114.92
Q	Florists	11.64	7.20	- 4.98	13.86
R	Tobacco products	79.04	54.60	- 56.42	77.22
S	Alcoholic beverages to go	58.76	2.60	- 26.00	35.36
T	Legal services	6.81	0.00	- 0.00	6.81
U	Other	6.81	10.00	- 22.00	- 5.19
	TOTAL	2628.36	2519.60	-1130.61	4017.35

* Letters correspond to the categories of goods and services on the questionnaire, Appendix A2-1.

Coefficients Used to Update 1961 Expenditure Data

All items	141.2
Food	135.2
At home	133.9
Away	139.8
Housing	150.8
Shelter	156.5
Fuel and Utilities	141.3
Furnishings and Operation	137.2
Apparel and Upkeep	139.2
Transportation	134.4
Private	133.7
Public	146.9
Health and Recreation	139.1
Medical	146.3
Personal	132.6
Reading and Recreation	135.6
Other	136.2
Tobacco	145.3
Alcoholic beverages	129.1

These coefficients were calculated by restating 1972 data on a 1961 base, using the Bureau of Labor Statistic's Consumer Price Index for the San Francisco-Oakland SMSA. Because data for 1961 was available for only the six most general categories, it was assumed that the price changes between 1961 and 1967 was the same percentage in each subcategory as it was in the more general category. After 1967, data was available for all subcategories. This method of updating the Consumer Expenditure data assumes that real income and the distribution of goods and services purchased were both constant over the 1961-1972 period. This assumption is not perfectly valid, of course, but for the limited purpose of estimating the changes in purchasing due to a change in the demographic character of San Francisco residents, this data is adequately accurate.

In Phase 1-A we proposed further adjusting the BLS data to include changes in the proportions of spending on various goods and services. Further analysis has shown that this would not be beneficial. We hoped to

perform the adjustment using Conference Board data on the changes in the proportions of spending nation-wide. This data covers the distribution of spending on goods and services for the nation in 1960, 1965, and 1970. It would be possible, therefore, for us to modify our 1961 data by assuming that the San Francisco distribution of goods and services changed in proportion to the changes in the national distribution. We have determined, however, that most of the changes in distribution are accounted for by varying rates of inflation among goods and services. Any redistributing that we execute on the basis of the national distribution, then, would be largely redundant because of the Consumer Price Index updating.

Sources: Handbook of Labor Statistics 1971, Table 118; Consumer Price Index, Pacific Cities and U.S. Average, September, 1972.

Source of national data on the distribution of spending on goods and services: The Conference Board, "A Guide to Consumer Markets 1972/1973," Report no. 569, page 162.

Responses to Preliminary Questionnaire

IV. Finally, we are interested in knowing your views regarding the pleasantness or unpleasantness of shopping in downtown San Francisco, apart from the availability of goods and services.

A. Have any factors caused you to decrease your shopping in downtown San Francisco? (Please check).

22 traffic congestion
8 sidewalk congestion
10 slow public transportation
1 poor street maintenance
3 air pollution
3 noise from traffic
2 noise from construction
3 windiness at street level
20 insufficient convenient parking
2 threat of crime
1 general visual appearance of high-rise buildings
2 shadows cast by big buildings
1 increase in size and scale of downtown buildings
3 decrease in downtown open space

B. Would any factors cause you to decrease your shopping in downtown San Francisco if they were to worsen? (Please check).

19 traffic congestion
11 sidewalk congestion
11 slow public transportation
3 poor street maintenance
5 air pollution
4 noise from traffic
5 noise from construction
5 windiness at street level
20 insufficient convenient parking
12 threat of crime
2 general visual appearance of high-rise buildings
3 shadows cast by big buildings
2 increase in size and scale of downtown buildings
5 decrease in downtown open space

C. Have any factors caused you to increase your shopping in down-

town San Francisco? (Please check).

__2__ fast public transportation

__1__ ample convenient parking

__1__ crowds and bustle

__4__ general visual appearance of high-rise buildings

__6__ impressive size and scale of downtown buildings

__1__ low threat of crime

__5__ other (please specify) (1)-Convenient to stores; (2)-More interesting stores; (3)-Exercise at lunchtime; (4)-Major stores; (5)-Density of shopping area

D. Would any factors cause you to increase your shopping in downtown San Francisco if they were to improve? (Please check).

__19__ efficiency of public transportation

__23__ ample convenient parking

__21__ less vehicle traffic

__9__ less sidewalk congestion

__4__ lower threat of crime

__1__ better maintenance of streets

__6__ less air pollution

__6__ increase in downtown open space

__3__ reduction in noise

__2__ other (please explain) (1)-Better stores for comparative shopping; (2)-Proximity of major department stores.

E. Which three factors do you consider the most important in determining where you do your shopping, apart from the availability of goods and services? (Please number 1, 2, and 3 in order of their importance to you).

- points (3 for 1st, 2 for 2nd, 1 for 3rd)

__25-55__ traffic congestion

__7-15__ sidewalk congestion

__28-68__ availability of convenient parking

__3-5__ windiness at street level

__1-1__ size and scale of buildings

__2-3__ availability of open space

12-25 efficiency of public transportation

5-7 maintenance of streets

2-5 noise

4-7 air pollution

5-8 threat of crime

4-5 proportion of shade and sunlight at street level

3-7 other (please explain) (1)-General attractiveness of shopping area-ranked #1; (2)-Price-ranked #1; (3)-Disposition of employees-ranked #3

THANK YOU FOR YOUR COOPERATION.

Source: Tabulation of 38 preliminary questionnaires.

A. BUSINESS ACTIVITY (continued)

3. Construction and Investment

a. Purpose

The basic purpose of this section is to trace the earnings accruing to various participants in the development of high-rise buildings. The distribution of these earnings will then be considered with the employment wage and salary earnings gained or lost because of different levels of construction and economic activity associated with a development alternative. (See sections on Quantity and Types of Jobs and Earnings, infra, for a discussion of the wage and salary changes due to a development alternative).

b. The Method

(1) The Role of Participants in High-Rise Development

We have discussed the role of various development participants with bankers, general contractors, building appraisers, architects, and builders. The information which follows is based on these discussions. Whenever it was possible we tried to check the accuracy of the data by checking several sources for the same information.

The initiator of a high-rise development is usually a developer. His primary role in the development is to coordinate the various activities involved in building a high-rise. Examples of his functions are arranging financing, hiring architects and engineers, finding a realtor to assemble a parcel of land, contracting to have the building built, and negotiating leases with tenants. The developer is also involved in the financing to the extent that he provides the initial capital. The proportion of total capital which the developer provides varies drastically, from nothing upwards. A typical proportion might be about ten percent.

The return on the developer's investment varies as widely as the amount itself. Because the developer provides services (as described above) other than financing, he would normally receive a return even if his capital investment were zero. Because the developer must service the debt and pay taxes and

operating expenses before he is entitled to any return, he bears the greatest risk of the success or failure of the development. For bearing this risk, the developer will demand the promise of a higher rate of return than would be normal for a lower risk investment. A typical rate of return to the developer would be 12-14 percent after paying property taxes, interest, and management expenses and after deducting depreciation. This return is before the developer's income taxes.

A second primary participant in high-rise developments is the group of investors who finances them. Typically, the investors will loan 75-100 percent of the total cost of a high-rise, the amount varying according to the risk of the development and the degree to which the investor wishes to accept the risk. Typical investors include banks, insurance companies, pension funds, and real estate investment trusts. The return on their investment varies according to the prime rate of interest, the proportion of the total cost which is being financed, and the percentage of floor space which has been leased to long-term tenants. Typical interest rates which are paid to these investors are currently about 8-9 1/2 percent.

A third group of primary participants, the construction workers, is discussed in the section on Quantity and Types of Jobs, infra.

In addition to the major participants in high-rise developments, there are many secondary participants. These include the architects, engineers, attorneys, and realtors who help plan and facilitate the development. The architects, for example, not only design the configuration of the building. They also determine the height and size of the building, within the constraints provided by the developer, in order to maximize the developer's rate of return. The architect's fee for this design work is typically 3-5 percent of the total cost of the building. If the architect also accepts the supervisory responsibility of a consulting engineer his fee is typically increased another 2-3 percent of the total cost.

(2) Estimate of Participants' Earnings

Our method will derive two types of earnings estimates. First, for any development alternative we will state

in general terms the amount of earnings accruing to the various participants in the development of high-rises. Second, given several development alternatives, we will show how these earnings would change with changes in the level of development.

We are basing our method on a detailed analysis of the financial structure of a representative high-rise development. This financial package is only one of a great many possibilities, but it is typical of the financing schemes generally used. (See Appendix A3-1).

We will use this analysis to depict the general financial structure of the various development alternatives in Phase III. Because there are so many other permutations of financing schemes and because we will not be able to predict which schemes will be used, this depiction will not produce a precise estimate of the actual financial structure of the development. Hence, the financing scheme we use will not produce a precise estimate of earnings of the various participants. The scheme will, however, provide an estimate of the magnitude of earnings to the participants.

The reason that our method will not predict the exact financial structures is that these structures depend on many factors unrelated to development alternatives. For example, the condition of the money markets, not only in San Francisco but in other cities, influences what degree of financial commitment the investors will accept and what interest rate they will demand. Also, a building occupied by the owner may be completely financed internally. Because variables such as these are not predictable for a general development alternative, we will not be able to present differing mixes of financing packages.

Although we cannot derive precise earnings for each development alternative, we will be able to make meaningful comparisons of earnings between different development alternatives. As the amount of construction in particular development alternatives increases, the earnings should increase proportionately. Using our typical financial structure we will derive participant earnings from each development alternative. Comparing these earnings should produce a useful comparison of the impact of these development alternatives on the various participants' earnings.

Although it might be interesting to identify the portion of the high-rise development earnings which accrue to San Francisco residents, without knowing beforehand who the developers and investors might be, it is not possible to derive this information.

c. Test of the Method

We have tested our method by discussing the data with people experienced in banking and the construction industry. We have spoken to bankers, contractors, builders, architects, and building appraisers,and we are satisfied that our data is representative of a high-rise development.

We would have further tested our method by comparing our information with data from a detailed accounting of an actual high-rise development, if this were possible. However, such specific information is exceptionally difficult to obtain. But, based on the similarity of the information we obtained from various sources, we feel confident that our data is representative of most large developments in San Francisco.

Finally, we are aware that in this section we do not derive the kind of precise analyses that we do for other Urban Economic subjects. However, we feel that even an approximation of the earnings accruing to high-rise development participants is useful to reach a better understanding of the magnitude of the incentive to build them. It will also be interesting to compare the relative earnings generation for one development alternative versus another.

1) [illegible]

2) [illegible]

3

Financial Structure of a Hypothetical Office Building
(all figures in thousand dollars)

Cost Estimate:

Land (20,000 sq.ft. @ $100/sq.ft.)	2,000
Building (800,000 sq.ft. @ $35/sq.ft.)	28,000
Indirect cost (@ 13%)	4,000
	34,000

Interim Financing:

Entrepreneur's Equity	3,000
Defrayed costs	4,000
GAP loan amount	3,000
Floor loan amount	24,000
	34,000

Value (subject to completion and occupancy):

Gross annual income (85% efficiency x $9.00/sq.ft. 1 year)	6,120	
Vacancy allowance (5%)	- 306	
Effective gross annual income		5,814
Expenses (@ about 38%)		-2,214
Net annual income		3,600
Capitalized (@ 10%)		36,000

Permanent Financing:

Capitalized value	36,000
Maximum loan (@ 75%)	-27,000
Equity	9,000

Capital Structure and Income Distribution at 95 Percent Occupancy:

Defrayed profit, fees, etc. 4,000; Entrepreneur's equity 3,000	7,000 @ .1640	1,148.4
Mortgage loan (8 5/8% - 35 years)	27,000 @ .0908	2,451.6
	34,000 @ .1059	3,600.0

Source: Interview with a local banker.

A. BUSINESS ACTIVITY (continued)

4. Tourism

For the purpose of the present study, the tourism question of interest is largely an economic one: how do high-rise buildings and alternative development forms affect the contributions of visitors to San Franciscans' business and earnings? Visitor pleasure is relevant for its effects on willingness to come and to stay, but as an end in itself, is outside this effort's focus on San Francisco residents. How residents react to the same impacts which affect visitor pleasure is handled elsewhere in this study in great detail.

Tourism is an economic sector of substantial magnitude for San Francisco. The number of visitors registering in San Francisco hotels and motels in 1970 is estimated at 1.5 million and their expenditures are in the hundreds of millions of dollars. Of this amount, almost $80 million was for hotel or motel rooms and about $70 million for restaurants. About $40 million was spent in retail stores and about $25 million on entertainment. (Oestreich & Wassenaar, 1971). Appendix A4-1 details the breakdown of spending by visitor. These figures totally neglect visitors staying with friends, camping in the area, staying for one day, etc. The problem is to determine to what extent, if any, changes in the urban environment attributable to high-rise development influence the number of visitors, length of stay, expenditure per day, and composition of spending.

Unfortunately, specific quantification of these effects does not seem feasible within the bounds of this study, and very probably even in a large-scale study devoted to tourism alone. Neither aggregate nor micro approach appears realistically promising.

On the aggregate level, one could conceptualize relating number of visitors (of each type exhibiting a different expenditure pattern) or dollars of expenditure to various characteristics of the city (e.g., views, congestion) and exogenous factors (e.g., national and regional population and incomes), in some form of regression model. Coefficients found for variables which high-rises affect could be applied to the size of such impacts predicted in other sectors of the study to estimate impacts on the tourist economy. However, the process is unfeasible for this study on at least two fundamental grounds.

The first is a data problem. The Oestreich & Wassenaar study for the San Francisco Convention and Visitors

Bureau used hotel-motel tax records, together with questionnaires mailed to samples of registered lodgers, to estimate number of visitors and expenditures. This data is available for only one year and is difficult to obtain for the past. Data for non-lodgers is not presently available in any year and there is no practical procedure to obtain it. Thus any analysis would necessarily be only partial. The quantification problem for independent variables, e.g., the quality and variety of restaurants, makes even that partial analysis impractical.

The second problem, a statistical one, is perhaps even more intractable. The difficulty is in obtaining statistically unbiased estimates of coefficients for the variables which high-rises affect. Elementary econometrics dictate that biases will be introduced unless all variables which affect tourism, and are correlated (not necessarily in a casual relation) with high-rise related variables, are included on the right-hand side of the regression. No doubt a very large number of variables affect tourist activity, and many of them would be highly correlated with the variables of interest, simply by having increased fairly regularly with time. Successful identification and inclusion of this number of influences cannot be expected.

On a micro scale, one could ask individual visitors what factors affect their comings, goings and expenditures and try to model their responses. Oestreich & Wassenaar did ask their respondents for their likes and dislikes regarding San Francisco conditions. Again, non-lodgers are neglected. But the acute problem is that for quantitative results, people must know (at least implicitly) the magnitudes and combinations of changes on several aspects of the environment which would cause them to stay away, stay a shorter time, or spend less (and how much shorter and less.) We have tried various means to raise such questions with tourists in Ghirardelli Square, but even those who understood the objective and were eager to cooperate expressed no confidence in the meaning of their answers.

What we plan to do is to develop some partial qualitative indications of high-rise alternatives/impacts on tourism. We will do so in the following way: First, we will use the Oestreich & Wassenaar survey to determine those high-rise affected environmental factors which various types of tourists particularly like and dislike about San Francisco.

Second, we will note the effect of the various development alternatives on the environmental factors to which each type of tourist is sensitive. (These effects will be determined in other sections of the study.) For example, a large percentage of the business tourists may list traffic congestion as a feature of San Francisco which they dislike.

If we note from our study that a certain development alternative causes an increase in traffic congestion, we can conclude that the alternative will adversely affect business tourism. A result such as this is not qualitative to the degree that we would like, but it is important in that it is at least indicative of whether the effect is positive or negative.

We will determine the importance of these factors on visitors who are here for business, vacations and conventions. These distinctions are important in that the Oestreich & Wassenaar study notes that tourists who visit the city for various purposes affect different sectors of the economy to different degrees. This is noted by the fact that vacationers spent $129 million in San Francisco in 1970 while those here for conventions spent $96 million and businessmen spent $73 million. Each type of visitor spent different proportions of the total on various goods and services. See Appendix A4-2 for these estimates. Given these spending levels, we are able to determine whether a development alternative affects the group of tourists with the largest, medium or smallest impact on the various sectors of the economy.

This approach to measuring the impact of a development alternative on tourism has been tested in the following way. We have studied the Oestreich & Wassenaar study to determine what features of San Francisco various types of tourists especially like, and also those which they dislike. We have noted those features cited which may be affected by a development alternative. In the next phase of the study, after determining the magnitude and direction of this effect, we will be able to determine whether the alternative encourages or discourages a particular type of tourism.

The Oestreich & Wassenaar study included 1,547 questionnaires which were completed by registered lodgers in San Francisco. The questions asked include purpose of visit, length of stay, expenditures by type and income. Also, respondents were asked to list the features of San Francisco which they particularly liked and those which they disliked.

We can identify no factors directly related to development in the list of features people "enjoyed most" about San Francisco. Two features, "city atmosphere" and "sightseeing, views and scenery in general" are conceivably related to varying degrees of development. Because they are so vaguely described, we have no way of measuring the way in which they are affected by development.

However, in the list of features which people "did not like" about San Francisco, several are directly related to development. They are: 1) traffic congestion and problems, 2) construction and BART, 3) parking problems and expense.

not necessarily [illegible]

Traffic is the foremost concern of the "business only" visitors, while it is the secondmost concern of "pleasure-vacation" and "convention" visitors. "Construction and BART" is ranked fourth by the businessmen and sixth by vacationers and convention-goers. Finally, "parking" is ranked fourth in the list of concerns by businessmen, fifth by vacationers and eleventh by convention-goers. Thus, if a given development alternative worsens traffic conditions, it will discourage businessmen from visiting the city more than it will convention-goers.

The three factors discussed above are related to development alternatives in varying degrees. The effect of a particular alternative on traffic congestion will be measured in our study of transportation, and in the environmental section on traffic accidents. The effect on construction is a direct function of the extent of the development and will be measured as such. Finally, the effect on parking problems will be determined by our study of transportation.

We are well aware of the fact that this analytical method lacks the rigor of those in our other economic topics. It also fails to yield the kind of clear cause/effect relationships which our other economic and certainly environmental subject methodologies will, and because of this, we considered deleting this section from the subsequent study phase. However, we feel that although the method only gives an indication of how tourism in San Francisco will be affected, that indication is interesting and perhaps even valuable. The effort which will be required to perform the analysis is relatively small, and we feel that tourism is such an important economic factor that it deserves as much attention as we can give it, even under the severe constraints we have described above.

Appendix A4-1

Itemized Spendings of All San Francisco Visitors, 1970

Item	Dollar amount (in millions)	Percent of total
Hotel or motel rooms	$77.8	29.1%
Hotel or motel restaurants	20.1	7.5
Other restaurants	49.0	18.3
Retail stores	40.9	15.3
Local transportation	9.6	3.6
Sightseeing	6.7	2.5
Entertainment	26.2	9.8
Car: Oil, gasoline, servicing	7.5	2.8
Other	29.7	11.1
TOTAL	$267.5	100.0%

Source: Oestreich & Wassenaar,
<u>San Francisco Convention and Visitors Study</u>,
Part I, May 1971, p.31.

Appendix A4-2

Distribution of Visitors and Expenditures by Trip Purpose

	Pleasure/ Vacation	Convention	Business only	Other
Trip purpose	29.1%	17.0%	22.0%	31.8

Spending/per visit	Pleasure/ Vacation	Convention	Business only
Hotel or motel rooms	$76.12	$118.22	$73.46
Hotel or motel restaurants	18.87	31.26	20.51
Other restaurants	53.40	61.58	46.81
Retail stores	47.75	51.89	19.94
Local transportation	8.41	13.19	11.08
Sightseeing	11.86	8.68	1.63
Entertainment	23.43	37.75	24.30
Car: Oil, gasoline, servicing	10.01	5.48	7.82
Other	33.57	32.17	6.07
TOTAL	$283.42	$360.22	$211.63

Sources: Oestreich & Wassenaar
San Francisco Convention and Visitors Study, May 1971.
Part 1, p.41, Part 2, Table 5.

Firm Locations

1. The data base is 20.6 percent of the 19,005 San Francisco firms who were covered under the California Unemployment Insurance Code in 1971. (California Employment and Payrolls).

2. The headquarters were not identified in the office prospect file but were determined using Contacts Influential.

3. The size categories for office firms in square feet are the following: 1) less than or equal to 2,499; 2) 2,500 to 7,499; 3) 7,500 to 14,999; 4) 15,000 to 31,999; and 5) greater than or equal to 32,000. The categories for partial industrial firms in square feet are the following: 1) less than or equal to 19,999; 2) 20,000 to 49,999; 3) 50,000 to 99,999; and 4) greater than or equal to 100,000.

4. The floors are classified in five ways: 1) Floor 1; 2) Floor 2; 3) 3) Floors 3 to 10; 4) Floors 11 to 25; and 5) Over floor 25.

5. Exempt employment includes interstate railroad employment, self-employed, federal, state and local government employment, domestic services in private homes, persons in the employ of certain nonprofit charitable, educational, or religious organizations, persons in the employ of a son, daughter, or spouse, children under 21 employed by a parent, and certain other small groups of workers.

6. Since the survey was conducted randomly throughout the CBD, we assume that firms which are not adequately represented in the sample have a small proportion of the floor space in the CBD. They are, therefore, not important in the analysis. (See part (2) on Analytical Framework for a more thorough discussion of sample size by SIC code).

7. The "low rent" buildings surveyed are 550 California, Insurance Center, Hobart Building, Multiple-Tenant Building, Alaska Commercial, J. Harold Dollar, Sumito Bank, Mills Tower, and the Mills Building. The "high rent" buildings are Crocker-Aetna, West Coast Life, Crown Zellerbach, Bank of America, Bethlehem Steel, International, Wells Fargo Building, Mutual Benefit Life, and Embarcadero Center Number One. We were able to find adequate information on 702 firms.

8. This model is a modified version of one developed by Dr. Sol Rabin in an article noted in the bibliography.

9. The relationship is derived as follows:

$$\begin{aligned} V_n &= (D^* - D)/D^* \\ D^*V_n &= D^* - D \\ D^* - D^*V_n &= D \\ D^* &= D/1-V_n \end{aligned}$$

10. The model omits the analysis of any movement out of and into the CBD to and from other areas of the City. The validity of this omission is substantiated by data established by the Building Owners and Managers Association. The office occupancy survey for October, 1971 shows that, in a six-month period, only 20,460 square feet of space in the CBD was vacated by tenants moving to other areas of the City, and 13,054 square feet was occupied by tenants moving to the CBD from other areas of the City.

11. We are using the model only to determine whether firms will be forced to leave the CBD under a given building alternative. In order to do so, it is unnecessary to use separate analyses for high rent and low rent space. Demand pressure for high rent space causes demand to "filter down" to the lower rent space. Demand pressure for only the lower rent space causes demand to "filter up" to the higher rent space. This filtering occurs because a type of firm with a great necessity to locate in the CBD will pay the rents required to do so. It will pay until the rent becomes so high that it overrides "necessity to be in the CBD" as a criterion of a firm's location. Thus, those firms with a low propensity to leave the CBD will be the first to leave irrespective of the type of space for which the demand pressure initially exists. (See section 2 Constrained Development, part c on Ranking for a more complete analysis of this).

12. This data is from the Department of Human Resources Development.

13. The derivation of this office coefficient is discussed in Chapter B, Section 1, Quantity and Types of Jobs. It will be derived from the EEOC data in the next phase of the study. For this phase, we are using those developed for the New York Region.

14. The office prospect file was used to determine this ratio in the following way:

    1) The amount of partial industrial space which is devoted to offices in the CBD and in the City as a whole was found by multiplying the mean office size of a firm in a given SIC code (determined from the office file) times the number of partial industrial firms in the respective areas.

    2) The amount of office space (not including partially industrial office space) in the CBD and in the City as a whole was found by summing the total floor space in the CBD and in the whole City in the file.

    3) The results of step one and step two were added for the CBD and the City as a whole, respectively, and the ratio was constructed.

15. This figure of 17,046,735 square feet was obtained for October of 1971 from the office occupancy survey of the Building Owners and Managers Association. It is considered to be the best available estimate of floor space in the CBD. (Our sample covers only 65.5 percent of this space or 11,173,089 square feet). This date was used in order to be compatible with the September, 1971 employment data which was used.

16. This calculation removes any bias which our sample is thought to have toward the CBD. The multiplication of the employment ratio by the BOMA floor space serves to adjust for this bias equally among the SIC codes.

17. The office coefficients for the New York Region follow:

SIC	Coefficient	SIC	Coefficient
7-14	0.196	41-49	0.428
15-17	0.210	50-59	0.387
19-39	0.360	60-67	0.752
40	0.000	70-90	0.576

Source: The Office Industry: Patterns of Growth and Location

18. A simple explanation of the method used to calculate the growth rate of employment is the following. Given variable E or employment which is growing at approximately a constant rate of 100g percent per unit of time t, this assumption leads to the following table:

t	E
-10	$E_0 = A$
-9	$E_1 = A(1 + g)$
-8	$E_2 = A(1 + g)^2$
-7	$E_3 = A(1 + g)^3$
.	
.	
.	
-1	$E_9 = A(1 + g)^9$

We may thus say: (1) $E_t = AB^t$ (1), where $B = 1 + g$. Taking the log of both sides of (1), we get:

(2) $\log E_t = \log A + (\log B)t$

(3) Define: $Y = \log E_t$
$X_t = t$
$a = \log A$
$b = \log B$

Equation (2) may then be written as $Y_t = a + bX_t$. The coefficients "a" and "b" are estimated by applying a least square fit to Y and X. Since g = B - 1, the growth rate in employment is then found to be the antilog of b - 1.

19. The assumption is valid for all SIC codes whose employment is largely office-type. During the past ten years, most of the office space built in the City has been in the CBD, and in these cases office employment in the CBD clearly dominates the general employment trend.

    The assumption is also valid for firms which are largely industrial to the extent that their office and industrial space is growing at equal rates. It is an invalid assumption for these firms to the extent that their office space outside the CBD (which is located within their industrial plants) is growing faster than their office space in the CBD. This is, however, an unimportant case, given our analysis. Appendix A1-6 shows that SIC codes 19 through 39 (manufacturing) have very little office space in the City.

20. We studied the relocation of firms in two ways. We first traced each firm's location in the San Francisco Polk City Directory to note whether it could be found in the City after its original location was demolished. If so, we noted its address. We then gave the San Francisco Tax Collector a list of the firms which could not be found. Using his record on firms which pay business tax, he was able to trace many of these. We studied the firms displaced by the following buildings: West Coast Life Building, Transamerica Building, Pacific Insurance Building, Embarcadero Center, California Mutual Benefit Life, Crocker-Aetna, General Electric and Pacific Gas and Electric headquarters. The total sample was 247 firms. This sample is large enough to be used to check our method, but in the cases of certain SIC codes, it is too small to be used to determine relocation.

21. Printing and publishing establishments which are located in office buildings are considered to be office firms in our discussion. They compete for office-type space rather than for industrial space.

22. These rapid rates of decline may be due to automation and may, therefore, be an exaggeration when applied to office activity. However, as noted in the discussion on growth rates, this exaggeration does not greatly distort our analysis. This is because, as is seen in Appendix A1-6, these firms occupy very little non-headquarters office space in the CBD (a total of 376,174 square feet out of approximately 17 million square feet).

Retail Trade and Personal Services

1. Of the twenty-five copies sent to the law firm, sixteen, or sixty-four percent, were returned. Of the thirty copies sent to the architectural firm, twenty-three or seventy-seven percent were returned. One bank returned twenty-four out of forty, or sixty percent. The other made its own copies which it distributed. Finally, the holding company to which we sent fifty copies made more copies itself and returned 115.

2. Only fifty-five percent of the respondents answered the income question, which was optional, and length of time at present occupation did not seem to be an adequate surrogate for income in the cases of those who answered both questions.

3. The relationship of crime to development alternatives is discussed in the Environmental section dealing with that topic. The problem of parking is aggravated to the extent that a building alternative produces a denser downtown environment. The managers' concern with BART construction is localized to the Market Street area, but this may also indicate a general concern over the disruptive effects of construction activity. There is no obvious relationship between any particular development alternative and the presence of "undesirable" loiterers or pornographic stores.

4. Two of the noted advantages of the retail district, the variety of merchandise and its convenience to San Francisco workers, are both somewhat dependent on the density of development in the downtown area. Assuming that workers are not dissuaded from shopping because of crowds or other environmental concerns, then the denser the development in the downtown area, the more customers the shops will have.

   The responses regarding problems in the downtown indicate that people are concerned with their shopping environment: pollution, vehicle and pedestrian congestion, and inadequate parking. These factors are all functions of the density of development, and lead us to question the assumption that increased density only increases downtown shopping.

5. By examining those proposals which were considered to have a high potential contribution, we can determine what this Committee believed to be the most serious problems affecting retail trade. Several of these problems are related to various development alternatives. The Committee finding that a return of uniformed policemen to the downtown area would be of high contribution suggests that the Committee sees a fear for personal safety as a deterrent from shopping downtown. We analyze the effect of various development alternatives on the crime rate in the section on Crime. (See the Environment Section).

   A second such problem area is an insufficient number of parking spaces. The Committee ranks the contribution to the retail area of a solution to this problem as high. This problem is directly related to the density of development, aggravated by more highly dense development.

The third relevant suggestion which was rated as highly contributive was that of removing all cars from the downtown area. This suggestion indicates the Committee's concern with the traffic and concommitant pollution. These factors are also directly related to the density of development and are aggravated as density increases.

6. The Marina, Taraval and Parkside, Clement, Ingleside, and Bayview shopping areas were included in the survey. Of the 1,000 questionnaires sent out, 889 were returned complete. Merchants in every area except Clement Street, however, believe there is inadequate public parking and that the shortage is inhibiting business.

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Note on EEOC Data

The main source of data to be used in the employment analysis, provided by the Equal Employment Opportunity Commission (EEOC), was only obtained after the main body of this report was written. In later phases of the study, the EEOC data will be used to relate the type of firms affected by a development alternative to type of workers employed by these firms. The EEOC records include the number of employees of various occupations, races, and sexes in most firms with over one hundred employees in San Francisco in 1971. The data is separated into headquarters and non-headquarters establishments. From it, we have constructed a matrix for each type of firm, described by a two-digit Standard Industrial Classification (SIC) code. The matrix describes the percentage of employees in various occupations by race and sex, and it will be used to determine those employment characteristics for all firm types analyzed. Within a given SIC code, headquarters and non-headquarters establishments have different employment structures. We have constructed separate matrices for each as we have analyzed the locational decisions of headquarters and non-headquarters firms separately. Before we can release the matrices in a published report, they must be reviewed by the EEOC for content of confidential information. For this reason, they have not been included here. We have, however, analyzed the matrices and have found that the sample size is sufficient to make the data extremely useful.

To avoid delaying this phase of the report as much as two to three months, surrogate data was used where necessary to test our analytical methods. For example, one of the major uses of the matrices is to construct the office employment coefficients used in the firm location analysis. (See Chapter A, Section 1). As we noted, the coefficients which we have used to test our method appear to be too low for San Francisco. We expected them to be low because the coefficients are derived from the employment in the New York region, which includes a higher proportion of industrial activity, and therefore, a lower proportion of office employees than does San Francisco.

B. EMPLOYMENT AND EARNINGS & only primary considered — secondary / tertiary / ignored

1. Quantity and Types of Jobs

The quantity and types of jobs created by a given development alternative result from four main factors: 1) the locational decisions of firms, 2) effects of these decisions on retail trade, 3) construction activity, and 4) building maintenance activity. In our study, we have developed various methods for measuring the effect of these factors. In this phase we have collected and processed the data in order to determine that it can be used for the purposes intended.

a. Employee Characteristics for All Occupations

The main source of data used in the employment analysis has been recently obtained from the Equal Employment Opportunity Commission (EEOC). It will be used to relate the type of firms affected by a development alternative to type of workers employed by these firms. The EEOC records include the number of employees of various occupations, races, and sexes in all firms with over one hundred employees in San Francisco County in 1971. The data is separated into headquarters and non-headquarters establishments. From this data, we will construct a matrix for each type of firm, described by a two-digit Standard Industrial Classification (SIC) code. The matrix will describe the percentage of employees in various occupations by race and sex, and it will be used to determine these employment characteristics for all firm types analyzed. For example, if we find that 21,000 square feet of new office space will be occupied by law firms who will have 10 employees, our matrix will allow us to describe employees by occupation and sex. what will this tell us

Within a given SIC code, headquarters and non-headquarters establishments have different employment structures. We will construct separate matrices for each, analyze the locational decisions of headquarters and non-headquarters firms separately, and use the matrices to determine the employment characteristics by firm type.

(Before we can release the matrices in a published report, they must be reviewed by the EEOC for content of confidential information. The information in the matrices will be in sufficient aggregate form to protect the confidential nature of individual firm data. However, we have presented the matrices in a separate section so that the EEOC review would not delay the release of the main body of this I-B report.)

b. Jobs Derived from Firm Location Decisions

Since the development alternatives pertain mainly to the CBD and since most of the firms locating there are office-types, our

major analysis of firm locations will be in terms of office space. (See Chapter A, section 1 on Firm Locations). Our firm location analysis will indicate the net change in office floor space (in square feet) occupied by firms according to SIC code for both the CBD and for the city as a whole. We will convert this office floor space to numbers of office employees and will indirectly determine total office and non-office employment. Determination of non-office employment is important in the case of service firms which have employees who use the office as a base but who mainly work in the field.

We will first determine the number of office employees. This will be done using the ratio of square feet of office space to office employees in San Francisco. (See Chapter A, section 1 on Firm Locations for further discussion of this determination). Once the number of office employees is determined, we will use it to determine the quantity of total employment which is generated by a given amount of office space, by using an "office coefficient" derived from the EEOC data. This "office coefficient" is merely the percentage of employment in in a given type of firm which is found in offices. It is obtained for each SIC code by summing the percentage of employees which are professional, managerial and clerical workers. Sales workers will be added in the finance, insurance and real estate sector.

The change in quantity of total jobs will be determined by dividing the total change in office jobs by the office coefficient. For example, if 100 office jobs will be created in SIC 60, and if the office coefficient for SIC 60 is .4 (40 percent of the employees in SIC 60 are office workers) then the total employment increases by 100/.4, or by 250 employees.

why not multiply

Once the change in employment in all occupations is obtained, we will use the EEOC data to describe the employee characteristics by occupation, sex, and race. (See the discussion of this data in part a., _supra_).

c. Retail Trade Employment

(1) Purpose

The purpose of this section is to derive the change in employment in the retail trade sector using data on a change in retail sales.[1] In the section on Retail Trade we discussed how the impact of a development alternative on retail sales will be analyzed. This section will continue that analysis to show the effect on retail employment of a change in retail sales.

100 ÷ 4/10

100 × 10/4

are you getting the total impact of 100 employees [illegible]

(2) The Method

Generally, the change in the spending on any commodity will affect the number of people employed in selling that commodity. We will analyze this interaction for each commodity and each type of store separately.

(a) Explanation of the Method

The first step will be to sum the development-induced changes in spending by commuting San Francisco workers with the changes in spending by San Francisco residents, for each commodity (these changes are developed in the Retail Trade section, parts a. and b.). This sum represents the total change in retail spending in San Francisco for each commodity, for any particular development alternative.

Second, we will determine the percentage of spending for each commodity which goes to payrolls. To do this we use a matrix showing in which type of store each commodity is purchased and in what proportions. From Census data, we know the percentage of each store's income which goes to payroll, and by combining this information with the matrix, we derive the average percentage of expenditure for each good and service which goes to payroll. (See Appendix B1-1).

Third, by multiplying the changes in dollar purchases of each type of good and service by the payroll proportion, we calculate the change in retail sales payroll which results from a development alternative.

Finally, we will convert this aggregate change in payroll to changes in the employment in each occupation by using wage data and the EEOC data. The EEOC data will provide us with the distribution of occupations for the retail sector. (See part a., *supra*). We will then adjust that distribution by multiplying each occupation by its wage rate, using the Bureau of Census data to be published in March 1973 (See Chapter B, Section 3 on Earnings, *infra*, for a discussion of this data). Then we will allocate the change in retail sales payroll (derived in the previous step) to this adjusted distribution of occupations. These calculations will produce the change in employment for each occupation in terms of both numbers of people and payroll.[2]

(b) Example 1

For a simple example, assume a situation in which there is one good (books) and two types of stores (bookstores and newstands). Further assume an increase in spending on books of $100,000.

We would first construct a vector based on Census data showing the proportion of book sales going to each type of store, for example, 80 percent to bookstores and 20 percent to newstands. Suppose that the proportion of payroll to sales were 15 percent in bookstores and 20 percent in newstands. These figures indicate that 12 percent of all book purchasing goes to payrolls in bookstores, and 4 percent goes to payrolls in newstands. Summing these figures we find that 16 percent of book purchasing goes to payrolls. This is simply a weighted average of the payroll proportions for all types of stores.

Next, we can multiply the $100,000 change in spending on books by the 16 percent devoted to payroll to calculate a $16,000 increase in retail payrolls.

Suppose that the distribution of occupations in the retail sector was 60 percent sales personnel and 40 percent clerical. Suppose further that the average annual salary for these occupations was $10,500 and $6,750, respectively. Multiplying the percentages by the dollar amounts and dividing by the total yields the percentage of total payroll which goes to each occupation, i.e., 70 percent to sales personnel and 30 percent to clerical workers.

Finally, when we multiply these percentages of payroll going to each occupation by the change in total payroll, we obtain the dollar change in payroll for each occupation: $16,000 × 70% = $11,200 change in payroll for sales personnel and $16,000 × 30% = $4,800 change in payroll for clerical workers. Then when we divide these dollar amounts by the average salary for each occupation we obtain the change in employment for each occupation. $11,200 ÷ $10,500 = 1.07 persons, representing the change in annual employment for sales personnel. The change in annual employment for clerical workers is $4,800 ÷ $6,750 = .71 persons.

(c) Example 2

A more complex example is in Appendix B1-2. This

example assumes changes in spending on all commodities, and shows the proportions of spending in every type of store. These test calculations are based on data obtained from our preliminary survey of retail spending by commuters. For the analysis in Phase III, these data will be replaced with those obtained from our Phase III survey. Also, when we obtain the EEOC data and wage data, we will be able to derive the change in income and numbers of employees for each occupation.

(d) Race and Sex Characteristics

As explained earlier in this section (part a), we will use the EEOC data to determine the race and sex characteristics of those retail employees affected by a development alternative.

(3) Test of the Method

Our method of analyzing the impact of a development alternative on retail employment is straightforward. Although the calculations are complex, they are direct. Therefore, the "test" consists of insuring that the necessary data is available and useful. We have obtained all the data needed for our analysis and the data is now in a form ready to use. We have checked its applicability by doing all the calculations on sample data (see Appendix B1-2).

If our test analysis were based on data of commuter spending from our final survey, we could further validate our method by checking historical employment figures. Since our data is based only on a preliminary survey, however, historical employment cannot be used as a check until Phase III.

d. Construction Employment

(1) Purpose

One of the employment groups most effected by differences in development alternatives is that of construction workers. A recent study estimated that 2400 jobs per year were provided in construction of high-rise office buildings in San Francisco between 1963 and 1970 (Gruen, 1971). Our purpose in this section will be to estimate the changes in employment of construction workers due to the level of construction activity associated with various development alternatives.

(2) The Method

(a) Explanation of the Method

We proceed from a change in the square feet of office space being built to the effect on construction employment in several steps. First, the change in square feet of office space associated with any development alternative is derived in the section on Firm Locations in Chapter A.

Second, this amount of square feet is converted to construction costs using a cost per square foot ratio. For this ratio, we will use $30/sq.ft. This figure is a composite of estimates from general contractors, a banker, and the "Northern California Real Estate Report." We are using this estimate of cost for all heights and sizes of major office buildings. Our discussions with architects, contractors, and appraisers indicate that any variation in the cost per square foot as building height or size varies is not substantial enough to have a significant effect on the conclusions which we will derive from calculations using the cost estimate. Calculations using the data from the "Northern California Real Estate Report" show that the cost has been increasing at a rate of 5.6 percent per year. We will continue to inflate the cost at this rate.

Third, we will convert this estimate of total construction costs to on-site labor costs by multiplying total costs by labor's share of total costs. We will use 25 percent as an estimate for labor's share. This figure is based on discussions with several general contractors.

Fourth, by dividing the total labor cost by the average wage per hour we will derive the hours worked. Our wage information is from the 1970 Census of Population, "Detailed Characteristics," and is discussed in the section on Earnings, <u>infra</u>. We expect this data to be published in March, 1973.

Finally, we will convert total hours worked to man-years by dividing the hours worked by the average hours worked per year. We will use Bureau of Labor Statistics data and information from general contractors to derive the estimate of hours worked per year. The Bureau of Labor Statistics' "Compensation in The Construction Industry" lists average hourly wage for 1967. Dividing these two amounts

yields about 1800 hours per year. Updating this figure to 1972 and adjusting it for the Bay Area, we obtain an estimate of 1700 hours per year.

Once we have determined the number of construction jobs which will be created by a given development alternative, we will use the EEOC data (see part a) to determine the occupation, race, and sex characteristics of the construction workers.

What About 2nd effects (e retail stores grocery etc)

(b) Hypothetical Example

If a development alternative includes the construction of 500,000 square feet of office space, the following calculations determine the effect on construction employment. First, the 500,000 square feet addition is multiplied by the \$30 cost/sq.ft. to obtain a total construction cost of \$15,000,000. This cost is multiplied by the 25 percent labor share of total cost to obtain the labor payroll of \$3,750,000. This is divided by an average wage rate and for this example we are using \$9.00 per hour to obtain the total hours worked by construction employees of about 420,000. These hours are then divided by the 1700 hours worked per year to arrive at about 250 man-years of construction labor required for the development alternative.

(3) Test of the Method

In order to test the accuracy of our data, we have discussed them with persons experienced in the construction industry. We have talked with general contractors, building appraisers, architects, and bankers. We have used published data wherever possible, for example, the "Northern California Real Estate Report" and the Bureau of Labor Statistics' "Compensation in the Construction Industry."

In order to test the usefulness of the data, we have executed a sample calculation of the type which we will use in Phase III. (Refer to the preceding Hypothetical Example). We conclude that the data is suitable for our analysis of development alternatives in Phase III.

e. Maintenance Employment

Another employment group which is directly affected by the differences in development alternatives and is not included in the firm location section is that of maintenance workers. From the "1971 Office Building Experience Exchange Report" we have obtained labor costs per square foot for the maintenance of office buildings, by size and by height. (See

Appendix BI-3). In order to note the effect of a development alternative on maintenance-employment we will simply multiply these costs by the changes in square feet in various sizes and heights of office buildings. By dividing this total labor cost by the wage rate (See discussion on Census data in Chapter B, Section 3 on Earnings) we can derive the change in employment of maintenance workers. By using EEOC data we can determine the demographic characteristics of these workers.

Appendix B1-1

Matrix of the distribution of sales of goods and services by type of establishment

Type of store (SIC) Payroll percent		Liquor store (592) 6.20%[2]	Hard-ware (52) 14.04%	Gen'l merchdsg (53pt) 19.40%	Direct selling (53pt) 22.88%	Food (54) 10.00%	Auto dealers (55ex554) 11.16%	Service stations (554) 10.93%	Cloth-ing (56) 16.07%	Furni-ture (571) 15.29%	Appli-ances (572) 15.37%	Radio-TV (573) 13.69%	Eating-drinking (58) 28.56%	Drug (591) 15.40%	Book & etc. (594) 15.04%	Sport. goods (5952) 11.88%	Jewel. (597) 18.00%	Flor-ists (5992) 19.93%	Cigar stores (5993) 11.11%	New-stands (5994) 18.04%	Camera (5996) 11.13%	Gift (5997) 16.15%	Optical goods (5999pt) 22.80%	Laundry (721, 725,727) 43.72%	Barber beauty (723-4) 48.93%	Auto serv. (752-3) 29.09%	Auto rental (751,754) 15.74%	Medical serv. (80) 69.11%	Law firms (81) 69.11%	TOTALS	Adjusted payroll percentage
Type of commodity																															
A Prepared food and drink[1]	1	.30[3]		1.81	1.24	.79							95.02	.73					.05			.02								99.94[5]	
	2	.02[4]		.35	.28	.08							27.14	.11					.01			.00								27.99[6]	28.01[7]
B Groceries	1	.94		1.73	1.10	95.20		.04					.52	.38		.01			.02											99.94	
	2	.06		.34	.25	9.52		.00					.15	.06		.00			.00											10.38	10.39
C Home furnishings	1		21.61	41.71	.33	.52	.08		.12	25.34	6.52	.27		2.61	.01		.67					.15								99.94	
	2		3.03	6.09	.08	.05	.01		.02	3.87	.10	.04		.40	.00		.12					.02								16.74	16.75
D Clothing	1		.04	48.01	.08	.10			45.24	.07				.99		.22	5.03					.17								99.95	
	2		.56	9.31	.02	.01			7.27	.01				.15		2.61	.91					.03								17.74	17.75
E Laundry, shoe repair	1																							100.00						100.00	
	2																							43.72						43.72	43.72
F Auto purchase	1						100.00																							100.00	
	2						11.16																							11.16	11.16
G Auto service	1		.20	3.24			17.20	54.21						.18												24.95				99.98	
	2		.03	.63			1.92	5.93						.03												7.26				15.79	15.79
H Auto rental	1																										100.00			100.00	
	2																										15.74			15.74	15.74
J Medical goods	1													94.42									5.57							99.99	
	2													14.54									1.27							15.81	15.81
K Medical services	1																											100.00		100.00	
	2																											69.11		69.11	69.11
L Personal goods	1	.29	.19	25.07		38.36			2.71					32.85					.04			.13								99.96	
	2	.02	.03	4.86		3.84			.45					5.06					.00			.02								14.31	14.32
M Personal services	1																								100.00					100.00	
	2																								48.93					48.93	48.93
N-O Recreational goods	1		1.80	25.25	.12	.20	10.07		.58	4.17		32.78	.18	2.64		11.77	.35				10.01									99.92	
	2		.25	4.90	.03	.02	1.12		.09	.64		4.49	.05	.41		1.40	.06				1.11									14.57	14.59
P Books, magazines	1														77.38					22.62										100.00	
	2														11.64					4.08										15.72	15.72
Q Florists	1																	100.00												100.00	
	2																	19.93												19.93	19.93
R Tobacco	1	8.85		3.53		59.70		1.98					3.07	14.80	.11	.05			6.86	.86		.13								99.94	
	2	.55		.68		5.97		.22					.88	2.28	.02	.01			.76	.16		.02								11.54	11.54
S Alcoholic beverages	1	62.83		2.22		29.12							1.10	4.30		.04			.26	.04										99.96	
	2	3.90		.43		2.91							.31	.66		.00			.03	.01										8.26	8.26
T Legal services	1																												100.00	100.00	
	2																												69.11	69.11	69.11
U Other	1																														
	2																													21.13	21.13[8]

Appendix B1-1

Footnotes

1. These letters correspond to the letters categorizing the goods and services in our questionnaire; see Appendix A2-1.

2. These percentages are the proportion of the sales of each type of store which goes to payroll.

3. This number, and every number in the rows numbered "1", is the percentage of the particular commodity which is sold in that particular type of store.

4. This number, and every number in the rows numbered "2", is the percentage of total sales of a particular commodity which goes to payrolls in the particular type of store designated in the column heading. This amount is derived by multiplying the amount indicated by footnote 2 by that indicated by footnote 3.

5. This amount is simply the sum of the row it is in. It shows the percentage of the sales of the particular commodity which is accounted for by the store types listed.

6. This amount is the sum of the row it is in. It is the percentage of the total sales of that commodity which goes to payroll in the store types listed.

7. This amount is the amount in footnote 6 adjusted to account for all sales of the particular commodity. It is derived by dividing the amount in footnote 6 by that in footnote 5.

8. This amount is the weighted average of all goods and services.

Explanation of calculation in Appendix B1-1

The calculations for most of the coefficients were straightforward. For a few goods and services we were forced to allocate particular goods or services to different categories. For example, the data classifies jewelry and optical goods together, while in the questionnaire jewelry as an accessory to clothing and optical goods as a medical good. We allocated the jewelry and optical good category to our categories according to the type of store in which the goods were sold. We assumed that all goods in this category which were not sold in an optical goods store were jewelry. We made similar allocating assumptions regarding drugs and cosmetics and regarding TVs and home furnishings. The data for recreational goods and sporting goods is so intermingled that we are aggregating the two categories.

In order to derive a payroll coefficient for doctors we used the Barometer of Small Business. The cost structure for doctors was 16.58% for wages and 30.89% for other expenses. We aggregated wages and profits to derive the 69.11% figure, representing the amount paid to either the doctor or his staff.

Until we can derive better data, we are assuming that the cost structure for attorneys is similar to that of doctors. We have therefore used the 69.11% coefficient for attorneys, too.

This technique of using the average percentage of payroll sales for the marginal change in payroll/change in sales assumes that payroll is a linear function of sales. Although economies of scale may occasionally produce a decreasing function, there is no reason to believe that a linear function is not generally a good approximation.

Sources: Bureau of Census, "Retail Trade - Merchandise Line Sales," California, 1967;
Bureau of Census, "Retail Trade - Area Statistics," California, 1967;
Bureau of Census, "Selected Services - Area Statistics," California, 1967.

Appendix B1-2

Effect on Retail Employment of a Change in Spending

Category	Description	Change in spending ($1000)*	Payroll/spending (percentage)**	Change in payroll ($1000)
A	Restaurants, bars, cafes	612.30	28.01	171.51
B	Groceries	180.96	10.39	18.80
C	Household furnishings	80.96	16.75	13.56
D	Clothing and accessories	1585.08	17.75	281.35
E	Laundry, shoe repair	20.22	43.72	8.84
F	Auto purchase	149.33	11.16	16.67
G	Auto services	289.38	15.79	45.69
H	Auto rental	157.77	15.74	24.83
J	Medical care-goods	67.50	15.81	10.67
K	Medical care-services	55.86	69.11	38.60
L	Personal care-goods	54.12	14.32	7.75
M	Personal care-services	177.54	48.93	86.87
N	Recreational goods	43.29	14.59	6.32
O	Sporting goods and toys	59.46	14.59	8.68
P	Books, magazines, and newspapers	114.92	15.72	18.07
Q	Florists	13.86	19.93	2.76
R	Tobacco products	77.22	11.54	8.91
S	Alcoholic beverages to go	35.36	8.26	2.92
T	Legal services	6.81	69.11	4.71
U	Other	-5.19	21.13	-1.10
				776.41

*Column 1 is derived from Appendix A2-4. It assumes changes in spending due to 1000 more professionals, 1000 more clericals, and 500 fewer managers, all commuting San Francisco workers.

**Column 2 is from Appendix B1-1. It is the vector of the percentage of spending on each commodity which goes to payrolls.

Appendix B1-3

Annual Labor Costs of Maintenance of Office Buildings, by Size and by Height

Height in stories	Labor cost/square foot
< 10	69.2
10 - 20	85.1
20 - 30	97.0
30 - 40	116.4
> 40	86.9

Size in square feet	Labor cost/square foot
< 50,000	64.6
50,000 - 100,000	70.4
100,000 - 300,000	77.4
300,000 - 600,000	105.1
> 600,000	99.9

Source: 1971 Office Building Experience Exchange Report, Building Owners and Managers Association International, 1972.

B. EMPLOYMENT AND EARNINGS (continued)

2. Employee Residence Location

Once we determine the number and types of jobs provided by the various development alternatives, we analyze the resident - non-resident distribution of the employees. The types of jobs are described in terms of occupation, race and sex. (See previous section).

The methodology which we use to determine employee residence in these terms is based on data contained in the Home Interview Survey conducted by the Bay Area Transportation Study Commission (BATSC) in 1965. This survey consists of approximately 30,000 interviews selected randomly throughout the Bay Area. Each interview contains detailed information on residence by occupation, place of work, race and sex of the persons interviewed. Although the data is about eight years old, we expect that the general patterns which we are seeking to determine are substantially the same.

In this phase of the study we have made special computer tabulations of the home interview data in order to determine the level of confidence with which it allows us to predict the percentage of commuters described by combinations of these characteristics.[1] We have found that the sample which includes 7,703 commuters is large enough to allow accurate estimates of percentage of San Francisco employees who commute in terms of occupation and race and also in terms of occupation and sex. These percentages and their confidence intervals are shown in Tables B2-1 and B2-2.

We will determine which of these classifications to use under a given development alternative after we note the effect of the alternative on the distribution of employment. In those cases in which employment structure is significantly changed in terms of race, we will use occupation by race estimates. In those in which it is changed in terms of sex, the estimates of commuters by occupation and sex will be appropriate.

Although the confidence intervals for the commuter estimates of most of the classification are narrow, and therefore, statistically accurate, a few show a fairly wide confidence range. For example, (as shown in Table B2-1), we are 95 percent confident that the percentage of commuting female craftsmen, and foremen is within ±19.46 percent of 34.78 percent. Fortunately, however, the low level of confidence for a few classifications will not adversely affect our analysis to any large degree for the following reasons.

The classifications with wide confidence ranges are not of particular interest to us, and the occupations in which we are most interested have the narrowest ranges (eg. professional-technical, managers, and clerical workers). Also, there are relatively few workers in the low-confidence classifications, and no matter how they are affected, their net impact on our overall employment conclusions will be minimal.

Table B2-1

Percent of Commuters to San Francisco
(95% confidence interval)

Occupation	Male	Female	All
Professional, technical and kindred workers	65.57	38.86	57.10
	(1.69)	(2.55)	(1.46)
Managers, officials, proprietors except farm	77.57	33.33	69.88
	(5.58)	(13.77)	(5.58)
Clerical and kindred workers	54.59	45.06	48.65
	(5.31)	(1.43)	(3.27)
Sales workers	61.43	51.61	59.78
	(7.71)	(17.59)	(7.08)
Craftsmen, foremen and kindred workers	72.11	34.78	71.08
	(3.09)	(19.46)	(3.08)
Operatives and kindred workers	55.90	22.77	47.80
	(5.17)	(8.17)	(4.70)
Private household workers	--	16.00	19.23
		(14.37)	(15.15)
Service workers except private household	37.09	33.13	34.40
	(5.15)	(7.03)	(3.92)
Farm laborers, and foremen	75.00	--	75.00
	(42.43)		(42.43)
Laborers except farm and mine	64.35	--	63.10
	(9.34)		(9.31)

Table B2-2

Percent of Commuters to San Francisco
(95% confidence interval)

Occupation	White	Asian	Black	Spanish	Other
Professional, technical and kindred workers	59.79	32.77	34.05	43.18	40.00
	(1.53)	(6.85)	(6.86)	(10.34)	(24.79)
Managers, officials, proprietors, except farm	70.73	25.00	66.66	80.00	0
	(5.68)	(42.43)	(53.34)	(35.06)	--
Clerical and kindred workers	50.70	28.80	41.10	55.50	0
	(3.59)	(12.30)	(11.69)	(22.90)	--
Sales workers	61.34	27.27	66.66	3.00	5.00
	(7.47)	(26.31)	(53.35)	(35.06)	(69.29)
Craftsmen, foremen and kindred workers	73.39	5.00	55.16	65.38	66.66
	(3.23)	(17.32)	(13.92)	(18.28)	(53.34)
Operatives and kindred workers	55.80	17.07	36.11	41.28	0
	(5.53)	(11.57)	(15.69)	(21.05)	--
Private household workers	15.00	0	33.33	33.33	0
	(15.64)	--	(53.34)	(53.34)	--
Service workers except private household	39.88	8.57	34.78	25.64	20.00
	(5.05)	(9.27)	(11.24)	(13.70)	(35.06)
Farm laborers, and foremen	75.00	0	0	0	0
	(42.40)	--	--	--	--
Laborers except farm and mine	60.65	0	67.64	80.00	0
	(12.26)	--	(15.73)	(35.06)	--

B. EMPLOYMENT AND EARNINGS (continued)

3. Earnings

a. Purpose

The purpose of this section is to describe how we will analyze the effect of various development alternatives on the earnings of San Francisco workers. Previous sections describe how we will analyze development alternatives in order to derive the impact on employment (see section on the Quantity and Types of Jobs, supra). Using those employment analyses, we will multiply the changes in employment of various occupations (as a result of the impact of the various development alternatives) by the earnings for each occupation to develop the changes in earnings for the respective occupation. Our data will be detailed by race and sex to provide information for subcategories of the population.

b. The Method

Generally, we will use Bureau of the Census data on income by occupation for each race and sex. The 1970 data for the San Francisco-Oakland SMSA will be avilable in March, 1973, in the "1970 Census of Population-Detailed Characteristics, California". This publication is released state-by-state, and usually in a reverse order according to population. Data for approximately 35 states have already been released, and according to the U.S. Department of Commerce, the California data should be released by March. We have examined the analogous Oregon data and since the California data will be presented in the same format, we are certain that it will supply us with precisely the information we need.(1)

We have already obtained similar data from the "1960 Census of Population-Detailed Characteristics" and will analyze that data with the 1970 data to project trends in wages. We will use the Bureau of Labor Standard's Consumer Price Index for the San Francisco-Oakland SMSA to adjust these earnings data to constant dollars, and our analysis of the impact of any future development alternative will be based on this trend projection of real wages.

c. Test of the Method

The calculations used in our method are straightforward

and represent a standard method for this type of analysis. The "test" of the method is whether or not we can actually obtain the necessary data in a useful form.

As mentioned earlier, we have good reason to expect the 1970 Census data to be available before the beginning of Phase III. We have determined its format from examining analogous data from other states, and we are satisfied that this format is suitable.

We already have the 1960 data from which we will compute trends. Its format is similar to that of the 1970 data, and they can be easily compared in order to compute trends.

4. Unemployment

The occupational characteristics of the San Francisco unemployed are available for 1970 and are tabulated in Appendix B4-1 of this section. Based upon the analyses which we will develop to evaluate the economic conditions of the various development alternatives, we will determine a similar profile for the type of jobs generated for each alternative. Then by comparing the occupational characteristics of the unemployed with the profile of potential employment generation, we will indicate the relative potentials for the various development alternatives to reduce unemployment.

Although we will be able to match the skills for the jobs demanded with the skills of the unemployed worker supply, the competition for those jobs will include non-residents and even immigrants who may fill the job vacancies before unemployed San Franciscans. Therefore, we will be unable to determine the absolute reduction in unemployment which might be induced by a development alternative. We can only indicate the extent of the "pressure" which each alternative will exert to reduce unemployment. The method of matching job skills demanded and supplied requires no validation. It is simple and straightforward. However, the methods used to forecast job generation for the development alternatives is complex and is discussed in detail in the section entitled, Quantity and Types of Jobs.

Appendix B4-1

Occupational Characteristics of the Unemployed by Race and Sex, for San Francisco

	MALES			FEMALES		
	All races	Blacks	Spanish-speaking	All races	Blacks	Spanish-speaking
Professional & managerial	1938	145	186	978	86	80
Sales	738	30	93	554	60	34
Clerical	1718	252	160	2579	488	321
Craftsmen	2501	427	414	--	--	--
Operatives	2122	354	449	921	83	299
Other Blue Collar	--	--	--	216	21	27
Laborers except farmers	1273	399	293	--	--	--
Farm workers	117	23	31	33	10	8
Service worker except private household	--	--	--	1168	356	199
Private household	--	--	--	228	104	26
All services	2353	508	346	--	--	--
All Occupations	12953	2195	1972	7099	1296	1025

Source: Bureau of Census, 1970 Population Census - General Social and Economic Characteristics, California, 1972, tables 88, 94, and 100.

Quantity and Types of Jobs

1. This analysis will be used for SIC codes 52 through 59, 72, 75, and 79.

2. The mathematical statement of these calculations is as follows: "A" is an m x 1 vector of the changes in spending on m goods by all commuting San Francisco workers. "B" is an m x 1 vector of the changes in spending on m goods by all San Francisco residents. "C" is the algebraic sum of A + B, representing the total change in spending on m goods.

   "D" is an m x n matrix of the percentage of each of m goods which is purchased in each of n store types. "E" is a 1 x n vector of the percentage of sales which goes to payrolls in each of n store types. Multiplying D · E results in an m x n matrix, F, with F_{ij} representing the percentage of total sales of good i going to payroll in store type j. Summing this matrix over all store types results in an m x 1 vector, G, of the average proportion of the sales of each of m goods going to payrolls:

$$\sum_{j=1}^{n} F_{ij} = G_i$$

   Third, multiplying C · G results in H, the m x 1 vector of the dollar changes in payroll for each commodity. Summing this vector yields a single dollar figure, v, representing the increase in payroll in the retail sector:

$$\sum_{i=1}^{m} H_i = v$$

   Finally, we multiply a p x 1 vector, M, of each of p occupations' proportion of total employment in the retail sector by the p x 1 vector, N, of the average annual income for each of p occupations. Then we divide the resulting vector by the sum of all salaries in vector N. This results in R, a p x 1 vector of the proportion of all payrolls in the retail sector which goes to each of p occupations:

$$(M \cdot N) \div \sum_{i=1}^{p} N_i = R$$

   When we multiply these proportions by the total change in payroll, V, we obtain the change in payroll for each occupation, a p x 1 vector S. Dividing S by the vector of average annual income for each occupation, N, results in T, the p x 1 vector of the change in the number of employees for each occupation.

EMPLOYMENT AND EARNINGS FOOTNOTES (CONTINUED)

Employee Residence Location

1. Pat Hackett of the association of Bay Area Governments was extremely helpful in performing these special tabulations.

Earnings

1. Department of Commerce, Bureau of the Census, 1970 Population Census - Detailed Characteristics, Oregon, 1972, tables 175-176.

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C. TRANSPORTATION

An increase in the density of development in an urban area is likely to generate change in the demand for transportation. These development related impacts can be expected to extend beyond the specific area in which the increases in density take place. This section of the research effort will establish and test methodologies for measuring the effects that various levels of intensity of development have upon transportation systems in the urban area. Historical data will be employed when available.

Three areas of transportation will be studied for high-rise impacts. These areas are: (1) traffic generation, (2) traffic volumes and flows, and (3) costs of changes in transportation demands. In the area of traffic generation, trip generation characteristics of six categories of land use will be studied, and a methodology for determining the effects of changes in land use and density of development on trip generation will be proposed. Traffic volumes and flows on city streets and highways are related to and influenced by trip generation. For this segment of the transportation analysis major vehicle routes will be identified, and incremental changes in the volumes of traffic on these routes due to changes in land use and density will be estimated and analyzed with respect to road capacities. A methodology for identifying areas of potential congestion will then be developed.

The incremental increases in traffic volumes may increase the cost of providing adequate services. A methodology for estimating high-rise related maintenance costs will be discussed, along with previous studies which have dealt with the costs of constructing additional roadways. In a final section, recommendations concerning future procedures and surveys which will be needed in later steps will be made.

1. Traffic Generation

Different types and amounts of land use generate and attract varying amounts and types of trips. The analysis in this section will determine various trip characteristic breakdowns for selected combinations of land uses and intensities of development. The land use categories of concern are: (1) residential, (2) office, (3) retail, (4) hotel, (5) wholesale, and (6) industrial. The trip characteristics which will be studied are: (1) time of trip (number of peak hour vs. non-peak hour trips), (2) modal split (automobile, taxi, truck and mass transit), (3) trip purpose (work, shopping, social, business visits and

Figure 1

SAN FRANCISCO HOUSING ZONES

NORTH

0 2000 4000 6000
SCALE IN FEET

1 RICHMOND
2 MARINA
3 NORTHEAST
4 DOWNTOWN
5 WESTERN ADDITION
6 BUENA VISTA
7 CENTRAL
8 MISSION
9 SOUTH OF MARKET
10 SOUTH CENTRAL
11 BERNAL HEIGHTS
12 SOUTH OF BAYSHORE
13 INGLESIDE
14 INNER SUNSET
15 OUTER SUNSET
* OTHER SAN FRANCISCO

other), and (4) the distribution of the total number of trips generated by and attracted to the study area by community or zone of origin or destination. For this effort, the city of San Francisco was separated into 15 zones which are identical to those delimited in the 1971 Changes in the San Francisco Housing Inventory report conducted by the San Francisco Department of City Planning (Figure 1). Outside of San Francisco the Bay Area has been divided into three zones--East Bay, North Bay (Marin), and the Peninsula. In summary, the numbers, purposes, times, and distributions of trips between the study area and the various zones will be quantified for the selected land uses or block combinations of land uses.

The trip characteristics which have been selected provide insights into the nature of trips generated by various combinations of land uses and densities of development, and an understanding of how particular combinations of land use contribute to changes in the demand for transportation. The percentage and absolute breakdowns of trips by peak hour and non-peak hour indicate the degree to which a combination of land uses and level of development contribute to peak hour traffic and congestion. The modal split indicates the extent to which the automobile or taxi versus mass transit is used, and again, what the contributions to highway and street congestion are. The trip purposes supply further information about the association between land use and trip generation.

Anything written

Finally, the distribution of trips within San Francisco and the surrounding Bay Area communities serves to indicate in which areas the transportation systems (highways, streets, trains, etc.) will receive an increase in use due to additional density development in San Francisco. These traffic generation characteristics should, thus, provide detailed estimates of the degree of congestion and transportation facility usage that can be associated with various land use and levels of development.

a. Methodology

The selection of an appropriate methodology which will enable the objectives to be realized must be guided by the reasonability of the approach and the limitations of the available data. In Step 1-A, a variety of methodologies have been surveyed along with potential data sources. In this step,

ditto

an in-depth review of the various data as they would be applied to those methodologies was undertaken to determine the appropriate approach. It has been resolved that the limitations of the available data are such that the techniques previously suggested cannot be adopted. The data do not provide either the level of accuracy or detail required for the relatively sophisticated methods suggested. The general approach which has been selected and tested is simpler than those suggested methods, but is flexible enough to permit the differences in traffic generation of different levels of block development and combinations of land use to be identified. Instead of a regression analysis or gravity model approach, a method which develops ratios between units of analysis and trips will be applied.

One method which has been reviewed and applied involves estimating the standard ratio of trips to 1,000 sq. ft. of land use per unit (dwelling units, hotel rooms, etc.) and applying these standards to the amount of land use in a block to determine the generated traffic. For example, if 1,000 sq. ft. of retail floor area generates 12.7 trips and the number of square feet of retail floor area in a particular block is 8,000 sq. ft., then that block generates 102 retail-related trips. Aggregating similar calculations for the different land uses in a block type provides the generated traffic for that type. If percentage breakdowns of mode, time, purpose and origin/destination are available, then the gross number of trips may be separated into various categories.

This method has been adopted in the standard approach analysis of this section. Local traffic data could not be incorporated into this approach, but standard ratios have been selected and will be applied in the study area to estimate generated traffic. Unfortunately, the percentage breakdowns for purpose, and for trips by mass transit, truck and taxi, are not available. Only total trips generated by peak hour and non-peak hour, and area distributions for the different land uses have been estimated. In future steps, this method would be employed, provided adequate data may be obtained from a survey conducted for the purpose of this method and study. which it won't

There are two disadvantages of this approach. First, the standards do ~~not take into con~~sideration changes in density levels. The same standard is applied regardless of whether high-rise or low-rise developments are involved. Second, the

standards which are available have not been derived for San Francisco, but for other areas. The extent to which these factors create a bias would need to be verified in an independent large-scale survey which could not be undertaken in this step of the study. In a later part of this section, a survey which was conducted to test whether or not such an undertaking is suitable will be discussed.

Existing historical transportation data for the city of San Francisco has been reviewed and a methodology employing certain data has been developed. This second approach which will be tested is the development of ratios of trips between subject blocks and other areas by mode, time and purpose. The unit of analysis is the block type, instead of land use categories. The advantages of such an approach are its simplicity, use of existing data, and flexibility. Block related trips and trip characteristics can be quantified for gross classifications of block types for gradations of types for a discrete measurement of change in values of ratios. The data which is required to construct these ratios can be as gross or detailed as is available and desired. As the data currently available has been collected at the block level and does not distinguish trips by land use, this method of block type ratio is the only approach which can be developed from historical data.

The major disadvantage is that the method does not determine the variance in traffic generation characteristics by land uses. This is important as only specific land uses are high-rise oriented, and hence, a complete analysis must include land use considerations. Furthermore, in a block in which varying levels of density exist, selecting the appropriate block density level which will be assigned to it is difficult. Given the nature of historic data, however, this approach has been tested to see if these conclusions are true.

(1) Method of Standard Ratios

Several studies have been conducted relating trip generation to land use for various urban areas, and to provide rates of trip production similar to those needed in the present effort. In evaluating the applicability of those rates to the current analysis, certain factors must be considered. Travel patterns, modes of travel and frequency of trips tend to differ from urban area to urban area, as it may from time period to time period.

TABLE C-1

SELECTED TRIP STANDARDS 1

Land Use Category	Average Daily Automobile Trips Per 1,000 Sq. Ft. of Land Use
RETAIL	16.1
Book Store	33.7
Drug Store	26.7
Clothing	15.6
Grocery	15.2
Hardware	14.8
Department Store	12.7
Variety Store	7.2
Furniture Store	2.8
OFFICE	12.9
State Government Offices	29.8
City and County Offices	10.0
Federal Offices	9.3
HOTEL	1.5

Source: Bland, Richard C., Wilbur Smith & Associates Parking Studies, Traffic Generation: As Related to Land Use, University of California, Berkeley, ITTE.

These differences in travel patterns restricting the application of trip generation rates derived for one area to another urban area. Caution must be exercised in the selection of an urban area whose trip generation rates will be applied in the current analysis. For example, a survey of ten cities found that western states tend to generate greater numbers of trips per residential dwelling unit than do eastern states. Therefore, the trip generation rates utilized in the analysis should probably be higher than the national norm or that of the average of the eastern section of the country.

(a) Non-Residential Land Use Trip Ratios

In Table C-1, the daily number of automobile trips generated by various building types in seven urban areas have been summarized. The summary is based on parking studies conducted in those cities. The cities included in the summary are Las Vegas, Nevada; Nashville, Tennessee; Chattanooga, Tennessee, New Orleans, Louisiana; and Santa Rosa, Riverside and Westwood Village Shopping Center, California. Three of the cities--Nashville, Chattanooga and New Orleans--are in non-western states, but tended to have rates similar to those of western states. The other cities are western cities which, together with the three non-western states, provide a fair range of automobile traffic generation rates which may be used as standards in this study.

A second source of trip generation rates is the Progress Reports on Trip End Generation Research Counts by the State of California Business and Transportation Agency, Department of Public Works, Division of Highways. Their efforts cover many Bay Area communities but, unfortunately, they have not conducted an extensive study in San Francisco. Also of the land uses of concern in this study, they have concentrated on residential, industrial and warehousing. Table C-2 includes those surveys selected for use in this analysis. The standards from this source are for total vehicles and not only automobile trips.

The tables demonstrate the large variance in trip generation rates within the land use categories.

TABLE C-2

SELECTED TRIP STANDARDS II

Land Use Category	Average Daily Vehicle Trips Per 1,000 Sq. Ft. of Land Use
WAREHOUSE	6.0
Grocery Warehouse	4.9
Warehouse (+ Offices)	6.7
Chemical Warehouse	3.8
Grocery Warehouse	9.2
Warehouse & Pipe Foundry	5.6
INDUSTRY - MANUFACTURING	8.3
Light Manufacturing	5.8
Machine Manufacturing	6.4
Research and Development	4.6
Research and Development	12.7
Data Processing	12.2
OFFICE	9.4

Source: State of California, Department of Public Works, Division Of Highways, Progress Reports on Trip End Generation Research Counts.

Such variance is expected, given the differences in activities within a category. For the general trip generation purposes of the study, though, the ratios in these tables should prove to be adequate, while a more detailed analysis (a more detailed construction of ratios for the selected land uses) would require an extensive study.

Among the non-residential land uses, retail uses clearly generate the greatest number of automobile trips. This particular activity generates a greater number of trips per 1,000 sq. ft., due to the number of patrons that visit such establishments. Office land use is the next greatest trip generator. Again, the nature of the activity should cause this land use to be one of the larger trip generators.

In descending order of magnitude of trip generation, the other land uses are industry, warehouse and hotel. Only a small difference exists between the trip generation ratios of two of these three land use categories. Industry generates a slightly larger number of trips than warehousing per 1,000 sq. ft. of land use due to the large amounts of warehousing space used for storage. Hotels may also generate the few automobile trips because most hotel guests depend on taxis or mass transit for transportation, rather than on automobiles.

Wholesale trip generation standards have not been found in a search of the literature, but the standard should be between those of warehousing and industry in magnitude. Wholesale activities generate more trips than warehousing per 1,000 sq. ft. of land because not as much space is devoted to storage. Industry, on the other hand, employs a larger number of people and attracts and generates large numbers of work and business trips. A difference of only 1.3 trips per 1,000 sq. ft. exists between the standards of warehousing and industry and hence the average of 7.1 trips per 1,000 sq. ft. will be used for wholesale land use.

Non-automobile forms of travel (taxis, mass transit, etc.) cannot be dealt with in this segment of the

section. A search of transportation literature has failed to produce ratios of trips to land use and density which may be applied, and the availability and quality of non-automobile travel varies so greatly from area to area that the accuracy of those ratios would be questionable. An independent survey would need to be conducted in San Francisco to derive such ratios, and to ensure their applicability.

(b) Residential Land Use Trip Ratios

Trip generation ratios for residential land use must be treated in a different manner than have the non-residential land uses. The number of automobile trips generated for any size area is dependent upon the number of units of trip generating activity.

In the case of non-residential land use, the most helpful and available statistics were in terms of floor area. Of primary interest for this land use is the number of family units occupying a block. Hence, for residential development, the number of dwelling units is a more appropriate measure than 1,000 sq. ft. of land use, and statistics of trips per dwelling unit for the Bay Area have been selected for use in this study.

Table C-3 lists the ratios for multi-family complexes. A positive relationship between the number of dwelling units and trips generated per dwelling unit appears to exist. The implications are that a similar relationship exists between density and trip generation within the residential land use category. The transportation literature, however, indicates that the reverse trend is true. Automobile trips, in other parts of the country, exhibit an inverse relationship with density of development. This contradiction in findings supports the need for caution in the analysis of density/transportation relationships. For the purpose of the current analysis, the ratio in Table C-3 which seems most appropriate for the individual residential buildings in study blocks will be applied, and the sum of those buildings will be calculated for block trip generation totals.

Note 19.

Table C-3

Selected Residential Standards

	# Units	Automobile Trips Per Dwelling Unit
Multi-Family Complexes		
Garden Apartments	300	7.9
Apartments	182	7.0
Apartments	141	4.7
Apartments	121	3.4

Source: Progress Report on Trip End Generation Generation Count, State of California Department of Public Works, Division of Highways.

Note —

(c) Trip Purpose and Trip Times

Trip purpose and time distribution add significant insight into the task of forecasting future travel and congestion. Trip time distributions provide information about when vehicles are on streets, and together with the knowledge of the number of trips, areal distribution of trips and road capacities can be used to estimate times and areas of congestion. Trip purpose provides further insight into the frequencies of particular trips and how trips relate to land uses. A search of the existing transportation literature, however, has not provided a suitable trip purpose distribution for the individual land uses. Land use specific trip purpose distributions are necessary due to the differences in the nature of these activities. Office land use for instance should generate mainly work and business related trips, while retail land use would generate shopping trips. An empirical analysis would be necessary to derive these distributions and hence the topic will not be treated in this section.

Time distributions, however, can be discussed. Table C-4 provides two-way time distributions for selected non-Bay Area regions against which a similar distribution for San Francisco can be

TABLE C-4

SELECTED TIME DISTRIBUTIONS

Land Use	Percent
OFFICES	
Peak Hour	27.4%
Non-Peak Hour	72.6
DEPARTMENT STORES	
Peak Hour	22.9
Non-Peak Hour	77.1
RESIDENTIAL	
Peak Hour	25.0
Non-Peak Hour	75.0
AVERAGE	
Peak Hour	25.1%
Non-Peak Hour	74.9%

Sources: Parking surveys by Wilbur Smith & Associates in Santa Monica, Riverside and Westwood Village, California, including 6 offices and 5 stores.

New York State Department of Transportation.

compared (DPATS). The table contains time distributions ~~for~~ offices and department stores in Santa Monica, Riverside and Woodside Village, California and for a residential area in Great River, New York. An overall distribution has been derived from these survey distributions which will be used as a reference for all land uses and compared against a comparable distribution for San Francisco.

Table C-5

Peak Hour and Non-Peak Hour Trip Distribution

Downtown San Francisco	Percentage
Peak Hour	30.3%
Non-Peak Hour	69.7%

Source: 1965 Cordon Count Data for the Metropolitan Traffic District, San Francisco Department of Public Works.

Arthur D. Little, computer tabulation printouts for the San Francisco Parking and Traffic Survey.

Table C-5 provides a time distribution which has been derived for trips to and from downtown San Francisco. Compared with Table C-4, the peak hour generates more traffic in downtown San Francisco than it does in the other areas surveyed. Part of the difference may be rectified by weighting the land uses in Table C-4, but the total discrepancy cannot be accounted for. For this portion of the analysis, the distribution derived for San Francisco will be utilized so as to avoid introducing unnecessary complications into the analysis. What is indicated in Table C-4 is that in spite of differences in trip purpose distributions of land uses, the trip time distributions for different land uses are comparable.

(d) Trip Distribution by Area

Areal distribution of trips must be determined for the specific area being studied, and cannot be replaced by distributions generated for other areas. Therefore, an automobile trip distribution by area has been constructed from past studies of San Francisco in Table C-6. The trip distribution represented in this table indicates that 57% of total automobile trips to the downtown area are generated in San Francisco, in 1965. This contrasts with a 68% estimate generated from the DPATS study, and included in the San Francisco Downtown Zoning Study. The difference between these two estimates besides being generated from different data sources, is due to the inclusion in the DPATS estimate of all vehicles and not simply automobiles. The 57% estimate will be adopted in this portion of the analysis as mainly automobile travel is being dealt with in this section. It should be noted that the 18-zone analysis conducted in the next sub-section will not be made here due to data limitation.

Table C-6

Percentage Distribution of Travel to Downtown San Francisco by Automobile by Area

Area	Percentage
Mission-Bayshore	17.6%
Twin Peaks-Sunset	14.0
Richmond-Western Addition	12.3
Marina	13.5
Total San Francisco	57.4%
Peninsula	18.3%
East Bay	17.3%
North Bay	7.0%

Source: Transportation - Conditions, Problems, Issues, San Francisco Department of City Planning, Table 6.

TABLE C-8

AUTOMOBILE TRIP GENERATION BY BLOCK

Block #	Land Use	Size	Factor	Trip Generation
240	Office	664,988 sq.ft.	9.4	6,250
	Retail	26,540 sq.ft.	16.1	427
Total				6,677
336	Office	15,750 sq.ft.	9.4	148
	Retail	51,620 sq.ft.	16.1	831
	Hotel	67,250 sq.ft.	1.5	101
Total				1,080
325	Hotel	512,000 sq.ft.	1.5	768
Total				768
764	Federal Govt. Offices	1,200,000 sq.ft.	9.3	11,160
Total				11,160
3730	Residential	149 Dwelling Units	4.7	700
	Retail	27,925 sq.ft.	16.1	450
	Office	11,000 sq.ft.	9.4	103
	Hotel	10,738 sq.ft.	1.5	16
	Wholesale	23,250 sq.ft.	7.1	165
	Industrial	154,435 sq.ft.	8.3	1,282
	Warehouse	107,550 sq.ft.	6.0	645
Total				3,361

(e) Results of Method of Standards

These standards have been applied to six blocks in the study area. The small sample size selection has been made due to the extreme difficulty of collecting data in the empirical analysis in the next section. This sample, though, is sufficient to illustrate this approach. A list of the selected blocks by assessor code and characteristics follows in Table C-7, and Figure 2 identifies the sample blocks.

Table C-7

Selected Blocks

	General Characteristics	
Block #	Use	Max. Bldg. Ht.
240	Office, Retail	172 ft.
308	Park/Parking	--
336	Residential, Hotel, Office	82 ft.
764	Office	290 ft.
325	Hotel	270 ft.
3730	Industrial, Office, Mixed	30 ft.

For five of the six blocks selected for analysis, the ratios selected have been applied. The results of the analysis are summarized in Tables C-8, C-9 and C-10. The sixth block is a parking lot for which no ratio has been developed.

Table C-9

Trip Time Distributions

Block #	Peak Hour	Non-Peak Hour	Total Trips
240	2,023	4,654	6,677
336	327	754	1,080
325	231	533	764
764	3,381	7,779	11,160
3730	1,018	2,343	3,361

Figure 2

SPUR HIGH-RISE STUDY AREA

SELECTED SAMPLE BLOCKS BY ASSESSOR BLOCK NUMBERS

SOURCE: San Francisco Department of Public Works

TABLE C-10

TRIP AREAL DISTRIBUTIONS
FOR AUTOMOBILE TRIPS

Block Number	Marina	Mission-Bayshore	Twin Peaks Sunset	Richmond/Western Addition	Peninsula	East Bay	North Bay
240	901	1,175	935	821	1,222	1,155	467
336	146	190	151	133	198	187	76
325	103	134	107	94	140	132	54
764	1,507	1,964	1,562	1,373	2,042	1,931	781
3730	454	592	470	413	615	581	236

The results of this method indicate that within a land use category, the higher the density of development the greater are the number of trips produced. The general conclusion is not unexpected, but a more important consideration is the tendency for certain land uses to be associated with high-rise developments and thus, determine the contributions to total volume of traffic of high-rise developments. Office, hotel and residential land uses tend to be high-rise oriented while retail, warehousing and industry are low-rise users. These high-rise uses represent some of the highest and the lowest of the trip generators. Hence, no simple generalization concerning relative contributions to traffic volume of high-rise developments can be made.

This method will provide the increments in volumes of traffic generation that are needed from this section of the analysis. The necessary task which should be undertaken in future steps through surveys is to verify or derive different ratios which are appropriate for various density levels as well as land uses.

(2) Empirical Block Type Analysis

Several transportation studies of the Bay Area have been conducted in the past seeking to identify various patterns of transportation. As indicated in Step 1-A, the methodologies which were to be tested would utilize data from these studies. The methodologies which can be employed in this study are, of course, dependent upon the quality and quantity of available data. By this is meant that it is the data which, here, decides the methodology. As has been pointed out in the introduction, most of the data sources identified in Step 1-A prove to not be adequate for the purpose of this study, which is to relate land use and density levels to trip generation. Three data sources which could be included in this analysis will be discussed next with respect to their weaknesses and usability. These are the BATSC block level data, the Downtown Parking and Traffic Survey (DPATS), and the Northern California Transit Demonstration Project (NCTDP).

(a) Data Sources

The BATSC data, as described in Step 1-A, would be of extreme usefulness to this study, provided the operational problems could be overcome. Unfortunately, problems such as varying sample size at the block level, insufficient sample size at the block level, and various computer programming problems made this data source difficult enough to use so as to eliminate it as a potential source. It should be noted that these problems are peculiar to this level of data aggregation, and not necessarily true of the census tract or map zone and higher levels of aggregation.

The Downtown Parking and Traffic Survey (DPATS) has data for automobile, taxi and truck travel at the block level only. No distrinction for land use has been made, however, which is a major disadvantage. Unless a single land use takes up a major portion of the block, the trips associated with that block cannot be associated with a particular land use or density level. Data has been collected for purpose, time, number of passengers, origin/destination, and parking location by block.

Additional disadvantages of this data have to do with the orientation of the survey. The original purpose was to determine the demand for parking and whether the current supply of space met this demand. Hence, only vehicles parked in the study area were surveyed. Two problems arise from this orientation. First, using this data is difficult due to the differences in the nature of this study and the DPATS study. This study requires the quantification of trip starts and trip ends by block or land use whereas the DPATS data provides only trip end information, thus requiring the assumption that the number of trip starts is the same as the number of trip ends and that all trips associated with that block are recorded. In the DPATS survey, different blocks were surveyed on different days so that the possibility exists

that trips were not recorded for a block if the driver parked in a block not being surveyed that day. The second problem is an operational one. Vehicles parked outside the DPATS study area, but whose driver or passengers had study area destinations, are not accounted for. This is especially true for blocks near the study area boundaries. Also, many drivers would not or could not be interviewed. This occurs, for example, when the driver arrives before the morning hour in which the survey began, and leaves after the time when the survey ended. Thus, neither block destinations, area origins, nor trip purpose could be recorded. Only location and trip times of parked cars could be determined. These problems could create a serious difference between recorded block trips and actual numbers of trips.

The Northern California Transit Demonstration Project collected mass transit data, and the data complements the DPATS vehicle data. Greyhound, AC Transit, and Muni were covered in the surveys conducted. There has been some difficulty in using this data due to the limited type available. The only type of data at the block level is trip purpose and total trips. Trip distributions within the Bay Area are available at the zone (multi-block) level, and the study has adopted these as the true distributions for all the blocks in those zones. Any block in a zone is assumed to have the same trip distributions as that of the zone. Trip time data is not available, and assumptions as to the relationship between purpose and trip time were made. It is assumed that all work-related trips occur during peak traffic hours (6:00 a.m. to 9:00 a.m., and 4:00 p.m. to 6:00 p.m.), and that all other trips occur during non-peak traffic hours. A survey would be needed to produce the true time distribution of trips, but could not be undertaken in Step 1-B. Finally, as in the case of the DPATS data, trips starting

in a block are not known, requiring the assumption that the number of trip starts in a block is the same as the number of trip ends. A survey would be needed to produce the true time distributions of trips as well as number, purpose, and the necessary cross-tabulations.

Three other means of commuting to San Francisco exist. These are the Golden Gate Bus and Ferry System, the Tiburon Ferry, and the Southern Pacific Railroad. The Golden Gate Bus and Ferry System and Tiburon Ferry provide service between Marin County and San Francisco, while the Southern Pacific provides Peninsula-San Francisco service. Detailed block level data are not available and therefore cannot be incorporated into the present analysis.

Given the characteristics of the usable data which is available, the number of potentially employable methodologies is limited. For the purposes of this study, only the DPATS and NCTDP data could be used, and only block trips could be measured. Hence, block combinations of land use and density had to be measured against block trips. This approach is further inhibited by the requirement of 1965 land use data. As these two studies (NCTDP and DPATS) were conducted in 1965, block land use data needed to be collected for that year. Unfortunately, such land use data is not readily available. Several sources were researched with negative results. The budget and time constraints of the study were also such that a detailed reconstruction of 1965 land use in the study area from building and demolition permits was not feasible. Furthermore, the time and actual costs of collecting the trip data from the 4,000 page DPATS computer printouts were such that complete data for only a few blocks could be collected. Six blocks representing all of the land uses were thus selected to test this approach. These blocks were identified in the previous sub-section in Table C-7.

(b) Results of Empirical Analysis

The analysis in this segment is separated into two portions. The first employs the NCTDP mass transit data to determine mass transit trip generation for the available characteristics at block level. Tables C-11 through C-14 provide the summary of results for the six sample blocks. It has already been noted that for mass transit trips only trip purpose and trip end data were available at the block level. Areal distribution information was also available, but at the NCTDP survey zone (multi-block) level of aggregation. The column headings refer to the 15 city zones and the three neighboring zones that the Bay Area has been separated into. The zonal distributions are assumed to be applicable for the individual blocks that constitute the zone.

The second portion of the analysis involves the determination of the number of vehicle trips attracted to the sample blocks through use of DPATS data. The survey included 18 trip characteristics. Tables C-15 through C-20 provide the breakdowns for the trip characteristics which are useful in this study.

Although the DPATS study was designed to collect data for most of the trip characteristics included in this study, incomplete data at the block level was a critical problem. In numerous cases, the driver's purpose, origin, destination, and numbers of passengers were unknown. The incomplete data represents between .4% and 25% of the data for certain trip characteristics. The major categories of interest were not seriously affected, but conclusions which are drawn from an analysis must be tempered with the consideration of incomplete data.

From these tables several trip generation trends can be discerned. As has been pointed

TABLE C-11

TRIPS ATTRACTED TO NCTDP
BLOCKS 240, 764, 336, 3730, 308, 325

	2 (240)	6 (764)	7 (336)	11 (3730)	17 (308)	22 (325)
S.F. Housing Zone						
1	497	561	32	18	736	115
2	694	339	17	4	500	47
3, 4	806	491	26	22	1,160	217
5	209	297	20	18	378	42
6	179	121	16	13	229	21
7	296	178	23	18	273	32
8	113	115	7	21	124	18
9	80	67	3	14	56	7
10	57	84	4	0	43	5
11	46	38	4	2	46	5
12	37	50	0	0	48	4
13	140	225	13	16	227	21
14	167	118	12	15	167	16
15	338	290	27	0	394	32
Total S.F.	3,659	2,974	205	161	4,381	582
Areas						
East Bay	886	498	26	17	440	79
North Bay	53	31	1	0	44	4
Peninsula	91	97	4	0	71	6
Other	384	489	22	16	196	38
Total	5,072	4,089	257	194	5,132	700

Source: Northern California Transit Demonstration Project, computer printouts.

TABLE C-12

PERCENT DISTRIBUTION
TRIPS ATTRACTED TO NCTDP
BLOCKS 240, 764, 336, 3730, 308, 325

	2 (240)	6 (764)	7 (336)	11 (3730)	17 (308)	22 (325)
S.F. Housing Zone						
1	9.79	13.71	12.50	9.09	14.35	16.39
2	13.69	8.29	6.60	1.90	9.74	6.66
3, 4	15.90	12.00	10.00	11.10	22.60	31.00
5	4.12	7.26	7.82	9.10	7.36	6.07
6	3.52	2.95	6.30	6.77	4.46	2.97
7	5.83	4.36	8.85	9.09	5.31	4.61
8	2.23	2.81	2.85	10.78	2.42	2.54
9	1.57	1.65	.97	7.19	1.10	1.05
10	1.13	2.05	1.70	0.00	.84	.77
11	.90	.94	1.39	1.27	.90	.76
12	.72	1.22	0.00	0.00	.94	.54
13	2.76	5.51	5.15	8.46	4.42	2.95
14	3.30	2.89	4.74	8.25	3.26	2.24
15	6.67	7.09	10.35	0.00	7.67	4.63
Total S.F.	72.13	72.73	79.22	83.00	85.37	83.18
Areas						
East Bay	17.46	12.19	10.29	8.88	8.57	11.35
North Bay	1.04	.76	.28	0.00	.85	.53
Peninsula	1.80	2.37	1.72	0.00	1.39	.86
Other	7.57	11.95	8.49	8.12	3.82	5.47
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: Northern California Transit Demonstration Project, computer printouts.

TABLE C-13

MASS TRANSIT TRIP PURPOSE (TRIP ENDS) BY DESTINATION ZONE

	Work	Shopping	Personal Business	Social	School	Other	Unknown	Total
All Companies								
Block #240	4,632	131	213	31	0	9	56	5,072
#308	2,517	1,165	622	594	9	120	105	5,132
#325	384	52	56	102	17	88	0	700
#336	192	0	31	34	0	0	0	257
#764	3,699	49	197	48	10	72	13	4,089
#3730	170	0	10	9	0	0	5	194
AC Transit								
Block #240	621	0	0	0	0	0	12	633
#308	230	80	18	40	0	0	0	367
#325	36	0	0	0	0	38	0	74
#336	20	0	0	0	0	0	0	20
#764	644	0	20	0	0	0	0	644
#3730	3	0	0	0	0	0	0	3
Muni								
Block #240	3,761	131	213	31	0	9	44	4,189
#308	2,244	1,085	605	554	9	110	105	4,712
#325	338	52	56	102	17	40	0	606
#336	163	0	31	34	0	0	0	227
#764	2,610	49	178	48	10	72	13	2,981
#3730	150	0	10	9	0	0	5	174
Greyhound								
Block #240	250	0	0	0	0	0	0	250
#308	44	0	0	0	0	10	0	54
#325	0	0	0	0	0	0	0	0
#336	10	0	0	0	0	0	0	10
#764	445	0	0	0	0	0	0	445
#3730	17	0	0	0	0	0	0	17

Source: Northern California Transit Demonstration Project Computer Printouts, Simpson & Curtin Tabulations.

TABLE C-14

MASS TRANSIT TRIP TIME DISTRIBUTIONS
FOR SAMPLE BLOCKS

Block #	Peak Hour	Non-Peak Hour
240	4,632	440
308	2,517	2,623
325	184	124
336	192	65
764	3,699	390
3730	170	24

TABLE C-15

TOTAL VEHICLE TRIP ENDS IN SAMPLE BLOCKS

Block #	Parked in Block	Parked in Other Blocks
240	523	214
308	1,895	407
325	696	325
336	206	69
764	371	826
3730	477	54

TABLE C-16

TRIP TIME AND AREAL DISTRIBUTION FOR SAMPLE BLOCKS

Block #	Areal Distribution		Time Distribution	
	San Francisco	Other	Peak Hour	Non-Peak Hour
240	62%	38%	43%	57%
308	42%	58%	45%	55%
325	60%	40%	44%	56%
336	73%	27%	38%	62%
764	60%	40%	51%	49%
3730	67%	33%	39%	61%

TABLE C-17

VEHICLE AND MASS TRANSIT TRIPS TO SAMPLE BLOCKS

Block #	Mass Transit	Vehicle	Total
240	5,072	737	5,809
308	5,132	1,902	7,034
325	700	1,021	1,721
336	257	275	532
764	4,089	1,195	5,284
3730	194	531	725

TABLE C-18

TRIP GENERATION ESTIMATES

Block #	Standard Automobile Trip	DPATS Total Vehicle Trips
240	6,677	737
325	768	1,021
336	1,080	275
764	11,160	1,195
3730	3,361	531

TABLE C-19

TRIP PURPOSE

Block #	Shopping	Business Visiting	Work	Sales or Service	Freight Loading/ Unloading	Passenger Loading/ Unloading	Medical/ Dental	Social	Home	Other	Total
240	.8%	27.9%	55.7%	2.1%	7.7%	1.1%	.1%	1.2%	.2%	3.2%	100.0%
308	48.0	20.3	8.0	1.9	.6	.3	6.3	8.6	.7	5.3	100.0%
325	2.3	25.3	10.9	2.6	1.6	17.8	.1	5.9	22.6	10.5	100.0%
336	7.0	32.1	30.5	2.7	9.4	1.5	1.9	7.4	4.7	3.2	100.0%
764	.5	46.8	38.9	1.8	1.7	5.1	.1	1.9	.1	2.5	100.0%
3730	4.0	18.6	40.0	8.8	18.7	2.7	.0	.0	4.5	2.7	100.0%

TABLE C-19

TRIP PURPOSE

Block #	Shopping	Business Visiting	Work	Sales or Service	Freight Loading/ Unloading	Passenger Loading/ Unloading	Medical/ Dental	Social	Home	Other	Total
240	.8%	27.9%	55.7%	2.1%	7.7%	1.1%	.1%	1.2%	.2%	3.2%	100.0%
308	48.0	20.3	8.0	1.9	.6	.3	6.3	8.6	.7	5.3	100.0%
325	2.3	25.3	10.9	2.6	1.6	17.8	.1	5.9	22.6	10.5	100.0%
336	7.0	32.1	30.5	2.7	9.4	1.5	1.9	7.4	4.7	3.2	100.0%
764	.5	46.8	38.9	1.8	1.7	5.1	.1	1.9	.1	2.5	100.0%
3730	4.0	18.6	40.0	8.8	18.7	2.7	.0	.0	4.5	2.7	100.0%

out, the data sources do not permit a detailed differential analysis for land use or density. General conditions, though, can be determined. For example, a park/parking block surrounded by retail and office blocks attracts the greatest number of both mass transit and vehicle trips. The high-rise office/retail and hotel blocks generate the next greatest number of total trips, followed by low-rise mixed industrial and mixed residential blocks. In terms of relative use of modes, the mixed industrial and mixed residential blocks generate substantially fewer vehicle trips than mass transit trips.

With respect to areal distribution of vehicle trips, except for the park/parking block, the majority of trips ending in the sample blocks began in the city. The marked difference in the areal distribution for the park/parking block (Union Square) may result from the block's tourist appeal as well as its proximity to major retail stores. The office and hotel blocks have a higher and relatively constant proportion of trips from San Francisco (60% and 62%) while the mixed residential blocks derive three-fourths of its trips from the city.

Mass transit areal distributions differ from those of vehicle trips. The mixed industrial, hotel, and park/parking blocks have a larger proportion of mass transit trips starting within the city than do the office and mixed residential blocks. The office blocks in particular have a low percentage of trips starting in the city.

The trip time distribution shows a relatively greater stability than does areal distribution. The office blocks have a high percentage of peak hour vehicle trips, while the residential and industrial blocks show greater non-peak hour percentages. The differences in nature of activities of these land uses is the primary factor. Office blocks

TABLE C-21

SUMMARY OF DATA SOURCES

	Standard Approach - Trip Characteristics		
	Purpose	Time	Origin/Destination
Automobile	--	Selected Standards for Auto or Total Vehicles	Selected Standards for Auto or Total Vehicles
Truck	--	Selected Standards for Auto or Total Vehicles	Selected Standards for Auto or Total Vehicles
Taxi	--	Selected Standards for Auto or Total Vehicles	Selected Standards for Auto or Total Vehicles
Mass Transit	--	--	--

	Empirical Block Type Approach - Trip Characteristics		
	Purpose	Time	Origin/Destination
Automobile	DPATS	DPATS	DPATS
Truck	DPATS	DPATS	DPATS
Taxi	DPATS	DPATS	DPATS
Mass Transit	NCTDP	NCTDP	NCTDP

have a high proportion of worker trips which tend to be peak-hour trips. The other uses attract a smaller proportion of worker trips suggesting that those blocks contribute less to peak hour travel.

(3) Comparison of Estimates and Summary

A comparative analysis of the estimates derived from these two approaches indicates that neither approach should be depended upon without survey verification. The estimates derived from the application of standards are substantially higher or lower than was determined from the DPATS study, and the problems encountered in the DPATS and NCTDP data indicate that the final estimates to be used in future steps should not be derived from these sources.

Table C-18 provides the estimates for volume of traffic generated from the two procedures tested. Part of the discrepancy in estimates is due to the differences in what is being estimated. The standard approach estimated primarily automobile trips while the second procedure measured total vehicle (non-mass transit) trips. The second procedure should produce higher estimates. In four cases the reverse is true, with substantially greater numbers of automobile trips being estimated than total vehicle trips. It might be argued that the standards selected for use are 1969 standards and should not be compared with 1965 data (which is suspected of being incomplete) or that the standards are of a general nature and a discrepancy is expected when applied to particular blocks. The differences are too large, though, for such arguments to be accepted and applied in future steps without a survey to verify the applicability of the selected standards.

The large differences in the results of these tested methods suggests that an evaluation of the methodologies is necessary. In comparing the advantages and disadvantages, the initial conclusion is that the empirical block type approach is superior as data for this method is available for all trip characteristics and modes of travel. The facing table provides a summary of data sources and the trip characteristics for which they are used.

As has been noted, however, the incompleteness of the DPATS and NCTDP data creates validity problems and diminishes the viability of the approach. A more important consideration though is that the orientation of the block type approach does not lend itself to a transportation analysis. Travel patterns are land use related and the block type approach does not sufficiently distinguish these patterns. The standard approach, on the other hand, is based on land use and does distinguish such patterns. The standard approach can also be guided so as to provide trip generation estimates at the block level by aggregation. The main problem encountered in fully applying the standard approach is that data do not exist for these ratios to be constructed for all areas of interest. A survey might provide this data. To test the suitability of a survey, a small scale effort has been made and is discussed in the following sub-section.

b. Building Survey and Results

In the previous discussion of trip generation methodologies the disadvantages of each approach were identified. Overcoming these disadvantages would require an independent data gathering process which would provide a sufficient quality and quantity of information on trip habits. As a demonstration of such a process, a survey has been conducted in the Alcoa Building in San Francisco. The survey was a small-scale test of whether a response rate of sufficient size could be expected, and whether a survey would in fact prove to be feasible in terms of budget and time.

A few problems were encountered in this effort, but were easily overcome. The response rate was good; 70% of the building's employment was sampled with a response rate of approximately 80%. The only serious problem that was encountered was in the tabulation and data processing stage which took large amounts of time in spite of the modest scale of the survey. The survey was kept simple and short so as to encourage response, but took approximately one week to complete (including tabulation) with one person working full-time. The conclusion drawn from this effort is that, while the survey is both possible and useful in overcoming the problems of the methodologies tested, it must be kept at a reasonable scale if the study is to be kept within the original boundaries.

TABLE C-22

ALCOA BUILDING SURVEY TOTALS

Area	Start Time		Auto	Auto	Bus/						Parking	
	Peak Hour	Non-Peak Hour	Driver	Passenger	St. Car	Walk	Train	Ferry	Other	Total	In Bldg.	On Street
Zone 1	121	2	13	6	52	50	--	--	2	123	7	6
Zone 2	149	6	36	16	98	5	--	--	--	155	12	26
Zone 3	121	4	46	9	70	--	--	--	--	125	12	34
Zone 4	40	1	12	5	24	--	--	--	--	41	1	11
Total S.F.	431	13	106	36	245	55	--	--	2	442	32	77
East Bay	206	6	76	36	100	--	--	--	--	212	49	27
Peninsula	139	5	76	22	10	--	36	--	--	144	36	40
North Bay	151	2	52	11	70	--	--	20	--	153	22	30
TOTAL	929	26	311	105	424	55	36	20	2	953	139	174
Zone 1	13%	8%	10%	5%	42%	41%	--	--	--	98%	53%	47%
Zone 2	16	23	23	10	64	3	--	--	--	100	32	68
Zone 3	13	15	37	7	56	--	--	--	--	100	26	73
Zone 4	4	3	29	13	58	--	--	--	--	100	6	94
Total S.F.	46%	49%	24%	8%	56%	12%	--	--	--	100%	29%	71%
East Bay	22%	23%	36%	17%	47%	--	--	--	--	100%	64%	36%
Peninsula	15%	20%	53%	15%	7%	--	25%	--	--	100%	48%	51%
North Bay	17%	9%	34%	7%	46%	--	--	13%	--	100%	42%	58%
TOTAL	100%	100%	33%	11%	44%	6%	3.8%	2%	0.2%	100%	44%	56%

For the purposes of this survey the city was divided into four zones, and the surrounding counties were divided into three areas--East Bay, North Bay and Peninsula. Zonal definitions are in the appendix. Tables C-22, C-23 and C-24 contain summaries of the results of the survey. Modal split, trip time distributions, areal distributions and total trips are among the characteristics for work trips for which information was collected.

Some of the results which were found for the building as a whole are that about 47% of those employed in the building are from San Francisco, 22% from East Bay, 15% from the Peninsula, and 16% from the North Bay. Furthermore, 44% came by automobile, 44% by bus or street car, 3.8% commute by train, 2.2% by ferry, and 6% walk. None came by taxi and 2% came by another means (bicycle or other). Automobiles are used almost as frequently as mass transit and more than one-third of those trips begin in San Francisco. Areal distribution of automobile trips was also determined with 36% of all automobile trips beginning in San Francisco, 25% in the East Bay, 22% on the Peninsula, and 17% from the North Bay. The results of the survey cannot be compared with those of the two tested methods as it included data for only work trips. Also, the surveyed building is not in a block previously selected for analysis.

Aside from identifying such general relationships, the results of a survey such as this could be used to determine the purpose distributions, trip time distributions for all trips, modal split, and all other statistical and cross-tabulated data needed for a complete analysis. Given the problems of the two methods previously tested, a survey supplement would provide the necessary data to overcome those problems. In the case of trip generation where both the NCTDP and DPATS data could not provide trip starts in any block, a survey consisting of travel diaries or 12-hour interviews of persons entering and leaving the survey buildings would provide the necessary data. A 12-hour interview survey could also provide cross-tabulation trip purpose, trip time and areal breakdowns by land use which could not be derived in the method of applied standards. Finally, the ratios that have been adapted or derived may have changed since the past studies were conducted. A survey of modest size would serve to verify their constancy or indicate how these ratios may have changed.

TABLE C-23

AUTOMOBILE DRIVER START TIMES

	6:00 to 9:00 a.m.	Other
Zone 1	13	0
Zone 2	35	1
Zone 3	49	6
Zone 4	10	7
Total San Francisco	107	14
East Bay	73	3
Peninsula	73	3
North Bay	51	1
TOTAL	304	21
Zone 1	100%	0%
Zone 2	97	3
Zone 3	89	11
Zone 4	58	42
Total San Francisco	88%	12%
East Bay	96%	4%
Peninsula	96%	4%
North Bay	98%	2%
TOTAL	94%	6%

TABLE C-24

BUS/STREET CAR START TIMES

	6:00 to 9:00 a.m.	Other
Zone 1	52	0
Zone 2	95	3
Zone 3	53	17
Zone 4	25	0
Total San Francisco	225	20
East Bay	97	3
Peninsula	9	1
North Bay	69	1
TOTAL	399	25
Zone 1	100%	0%
Zone 2	97	3
Zone 3	76	24
Zone 4	100	0
Total San Francisco	92%	8%
East Bay	97%	3%
Peninsula	90%	10%
North Bay	99%	100%
TOTAL	94%	6%

c. BART Impacts

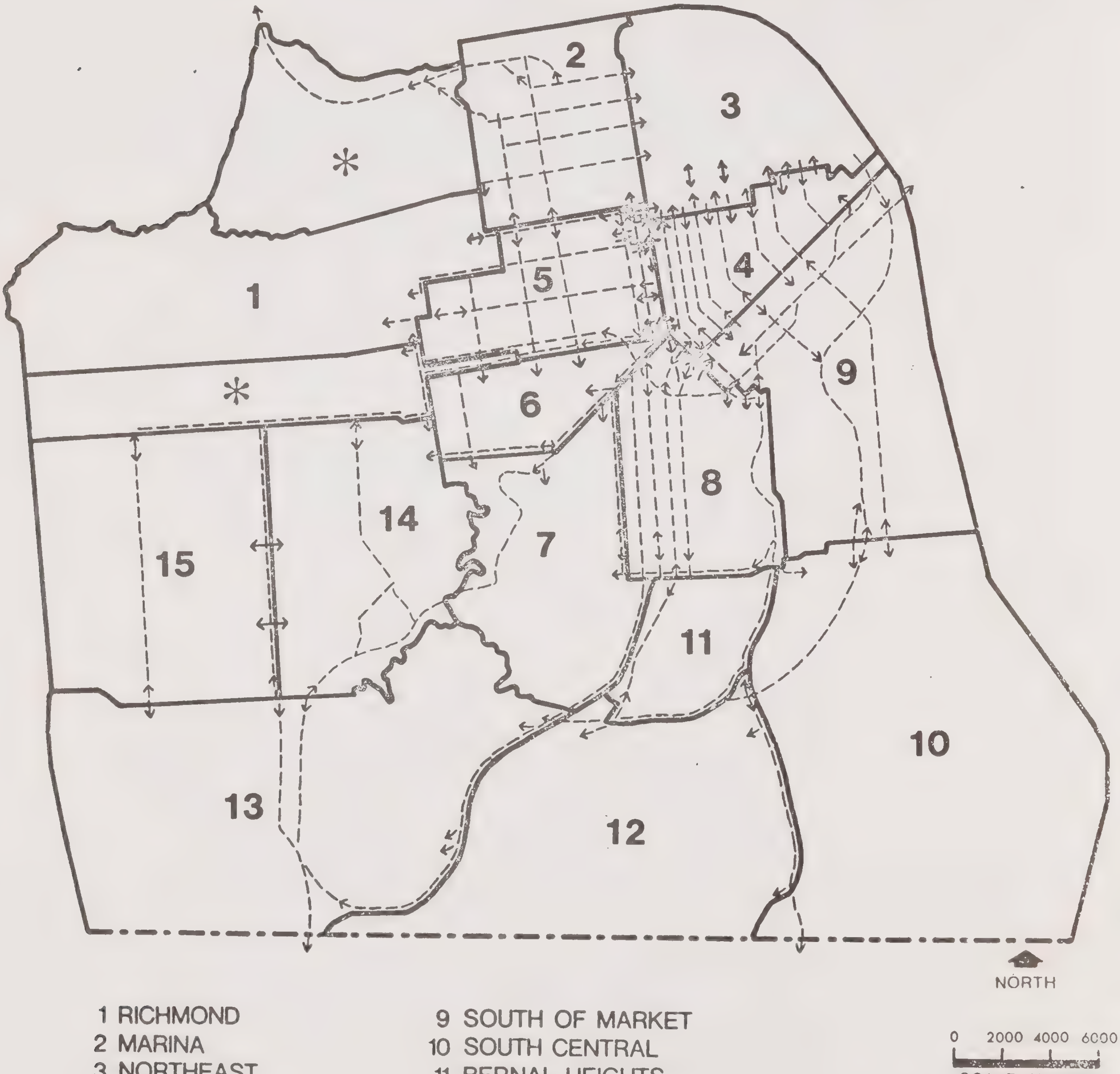
The inclusion of the BART system into the transportation network will affect the trip characteristic breakdowns that have been constructed. Modal split will be affected with less bus and automobile travel between the East Bay and San Francisco as well as within San Francisco. Also, the areal distributions may be affected due to the shorter trip durations afforded by the new rapid transit system. Trip time distributions, on the other hand, should not be affected. Estimating the magnitudes of these expected impacts is a difficult task given that BART is not in full operation. Considerations that must be made are the diversion rates of BART of current bus and automobile trips, and a possible secondary effect of increasing total automobile trips that results from the decline of bus service (especially the decline of AC Transit East Bay service). Estimates of diversion rates have been made by Simpson & Curtin in the Final Report of Northern California Transit Demonstration Project, and will be discussed, but the impacts on other trip characteristic breakdowns and secondary effects cannot be estimated until BART is in full operation.

The Simpson & Curtin estimates of diversion to BART from other modes of travel are limited to transbay travel. They estimate that 32.3% of the East Bay and 30% of the transbay automobile travel will be diverted to BART, while 90% of the East Bay and 80% of the transbay bus patronage will be diverted. These estimates have been examined by the BART planning personnel who feel these estimates need an update given the experience they have had. Similar such estimates do not exist for service within San Francisco, and hence the impact of BART on intra-city travel cannot now be estimated. The BART Planning Division is expected to derive diversion rates before June 1973, and such rates could be included at that time. The attitude that has been adopted is to delay a comprehensive test of estimating BART's impact until such time as suitable diversion rates are available. The currently envisioned procedure would apply these diversion rates to the estimates of automobile and mass transit trips going to or from zones which BART visits, providing an estimate of BART trips and appropriately altering the estimates of automobile and mass transit travel.

Figure 3

SAN FRANCISCO HOUSING ZONES

---- ROUTES BETWEEN STUDY ZONES 3 & 4 AND ALL OTHER ZONES



1 RICHMOND
2 MARINA
3 NORTHEAST
4 DOWNTOWN
5 WESTERN ADDITION
6 BUENA VISTA
7 CENTRAL
8 MISSION
9 SOUTH OF MARKET
10 SOUTH CENTRAL
11 BERNAL HEIGHTS
12 SOUTH OF BAYSHORE
13 INGLESIDE
14 INNER SUNSET
15 OUTER SUNSET
* OTHER SAN FRANCISCO

SOURCE: 1971 Changes in San Francisco Housing Inventory
San Francisco Department of City Planning

2. Traffic Volumes and Flows

In this section of the transportation study effort, major vehicle routes between each of the 15 city zones, the three Bay Area zones, and the two study area zones have been identified. The two city zones that make up the area being studied are Zone 3 and Zone 4 (Figure 3). Hence, for each of these two zones, routes to all other zones have been identified and the 1969-1972 volumes of traffic on these routes quantified for peak hour and 24-hour periods, using San Francisco Department of Public Works, Division of Traffic Engineering data. The intent here is to select routes and corridors upon which increments in traffic volume related to density-increasing developments are likely to flow between zones. Figure 3 illustrates the inter-zonal routes that have been selected within the city. For the three Bay Area zones, the routes are the Golden Gate Bridge, the San Francisco-Oakland Bay Bridge, Freeway 280, and Highway 101.

Having selected routes between the downtown study zones and all other zones, a method of allocating incremental increases in traffic between zones needed to be developed. Given that the construction of a major traffic model is not possible, a system of ratios was again developed which allocates this increment in inter-zonal traffic. The basis for this allocation is the existing ratio of volumes on the selected routes between zones. Thus, between any two zones A and B, the basis of allocation would be the relative volume of traffic on the selected routes between them. If only two routes were selected and route 1 had twice as much volume as route 2, then route 1 would receive twice as much of the predicted incremental increase provided its capacity was reached. This approach was suitable as long as adjacent zones were involved.

For non-adjacent zones, the volume of traffic on the selected routes as they enter the zone of destination was used to derive these ratios of allocation. In some cases, the subjective opinion of the analyst entered to override the results of this method. This occurred in the cases in which a large volume of non-study zone related traffic moved between zones on roads which are considered relatively secondary. The opinion of the analyst is based upon a road survey conducted for this purpose. Figure 3 indicates the selected inter-zonal network selected, and Figures 4 and 5 provide the traffic volumes on city streets.

It should be noted that at the time of this writing, certain city streets have undergone changes. In particular, Eddy Street and Ellis Street have become one-way. How these changes will affect traffic on these as well as feeder streets cannot be quantified until flow data is gathered; a task not undertaken in this step. The assumption that has been adopted is that the volumes in Figures 4 and 5 are suitable and will not be altered until the required information is available.

Several methods of determining street capacities have been researched for this portion of the analysis. Most of these methods require too great a level of detailed knowledge of street conditions. A simple yet effective method of estimation is needed to complete this segment. A method which has been devised and tested employs rule-of-thumb measures of capacity. After a discussion with personnel of the San Francisco Department of Public Works, Division of Traffic Engineering and the Institute of Traffic and Transportation at the University of California, Berkeley, standards of peak hour and non-peak hour capacities were tested for city streets. The following table lists these selected standards.

Table C-25

Peak Hour and Non-Peak Hour Standards

	Peak Hour	Non-Peak Hour
Highways	1,800	2,000
City Streets	300	1,200
Residential Streets	500	500

Peak hour capacities are estimated to be lower than non-peak hour capacities. The higher non-peak hour standard reflects a steady, relatively uninterrupted flow at a greater speed and spacing than occurs during peak hour traffic periods.

Applying these standards to all roads regardless of variances in conditions does create validity problems, but simplified alternative standards with significant advantages have yet to be refined. Furthermore, only a reasonable general estimate is needed which this approach should provide. In future steps, alterations in the standard to meet the general characteristics of the sample streets will be considered. From these estimates of street capacities the maximum capacities of the selected inter-zonal routes will be derived. The maximum capacity of the route will be that assigned to the street with the least capacity.

Figure 4

CITY & COUNTY OF SAN FRANCISCO
TWENTY-FOUR HOUR TRAFFIC FLOW
ON PRINCIPAL STREETS & HIGHWAYS
1969 - 1972

Figure 5

CITY & COUNTY OF SAN FRANCISCO

EVENING PEAK HOUR TRAFFIC FLOW

ON PRINCIPAL STREETS & HIGHWAYS

1969 – 1972

NOTES

1 FIGURES SHOWN ARE ACTUAL TRAFFIC COUNTS TAKEN IN THE EVENING PEAK HOUR AT VARIOUS TIMES IN THE YEARS 1969 THRU 1972, UNADJUSTED AS TO AVERAGE DAILY TRAFFIC.

2 LOCATION OF STREETS AND FREEWAY RAMPS ARE DIAGRAMMATIC ONLY

3 MAJOR ONE-WAY TRAFFIC FLOWS ARE SHOWN BY DIRECTION ARROW.

4 WIDTH OF FLOW NOT TO SCALE

DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING
DIVISION OF TRAFFIC ENGINEERING
DRAWN BY YTF DECEMBER 1971

Appendix Table C-II-1 lists the streets involved in the analysis and their capacities. As has been mentioned, the intent is to assign incremental increases in inter-zonal flows to the appropriate routes between these zones. It is possible that the capacity of such routes will be exhausted at the present time or before all allocations have been made. In this case, critical congestion points will have been identified.

3. <u>Costs of Changes in Transportation Demands</u>

Traffic congestion is the result of the contributions to total traffic volume by a multiplicity of sources of which high-rise development is a single factor. In the previous discussion, a method by which high-rise contributions to total volume of traffic could be measured has been developed. To identify that portion of the future cost of maintaining an adequately functioning network which is attributable to high-rise development would require a projection of future travel for all sources and a comprehensive share analysis. Such a project is outside the scope of this study, but certain procedures for estimating costs of maintaining the current network, and the total costs of adding new channels of travel to the network will be discussed.

a. Costs of Maintaining the Existing Network

Given the transportation network as it currently exists, the additional costs of maintenance that result from high-rise related traffic can be estimated. The proposed approach involves determining the current maintenance costs for the various segments of the network (freeway, streets, mass transit, etc.) and comparing those costs with the current volume of traffic by those modes. From these volume/cost relationships incremental costs can be derived, and used as the assigned marginal maintenance cost of high-rise related traffic. For example, total annual street maintenance costs for San Francisco's roads were $12.3 million in the 1971-72 fiscal year. Utilizing the 1972 traffic flow maps from the Department of Public Works, total volume of vehicle traffic for a 24-hour period can be calculated and compared with the maintenance cost. Unfortunately, the flow maps do not contain data for every street, but as the most frequently traveled routes (thus those most in need of constant maintenance) are represented, this estimating procedure should suffice.

This same marginal approach may be followed to derive the mass transit costs which are high-rise related. Cost data can be gathered from the appropriate agencies and compared with existing volume data. These cost/volume estimates would then be applied to the estimate of mass transit high-rise related trips providing an approximation of the new high-rise mass transit maintenance cost.

b. Expansion of Transportation Network

There are two primary means, other than changing current preferences for modes and patterns of travel, by which congestion pressures can be alleviated. These are: (1) the expansion of the capacity of existing transportation channels, and (2) the addition of new facilities. In this segment, the costs associated with various past proposals for new facilities along with a method for assigning costs of channel expansion will be discussed.

(1) Expansion of Existing Network

The estimation of costs of expanding the existing network such as road widening requires first, the determination of those channels (roads, routes, etc.) of travel which are likely to become congested. Again, utilizing the method previously described in Section 2 of this analysis, such congested channels will be identified. Subsequent to this, cost estimates for increasing flow capacity will then be derived. No simple procedure for estimating capacity increasing costs due to the variances in topography, street conditions, excess demand, and other cost factors. Hence, the cost estimation procedures which will be employed will be defined in future steps when channels of congestion are identified and alternatives decided upon.

In this portion of cost estimation, as well as the next which discusses new additions to the existing network, the portion of the cost that is associated with high-rise cannot easily be separated out. The necessity for new or enlarged freeways or mass transit systems is created by more than the contributions to traffic volume of high-rise developments. The number of non-high-rise factors are too numerous and the interrelationships too complex to be included in this

analysis, but exert too great an influence to be ignored in a partial analysis. As has been mentioned, to identify that portion of the costs that is related to high-rise development, a comprehensive share analysis of future travel projections would be required, but cannot be undertaken in this study. However, subjective estimates are possible and useful and provide an alternative to the undertaking of a comprehensive analysis. The estimated total volumes of new additions or expansions would be used from which a subjective estimate of high-rise related traffic would be derived. The portion of total cost which can be attributed to high-rise development would be equal to that portion of total projected volume which has been judged to be high-rise related.

(2) Additions to Transportation Network

The construction of new additions to a network system is designed to divert excess demand from heavily used channels. There have been numerous studies and design proposals for such construction, and these proposals would be discussed in future steps with respect to the additional capacity they would add, the addition's expected ability to absorb the congestion on inter-zonal routes, and their costs. Those proposals which have been researched and will be discussed in future steps are:

(a) Southern Crossing
(b) Hunter's Point Freeway
(c) Golden Gate Corridor
(e) Highway 101 - Golden Gate Bridge Connection

Included in the discussion of both the costs of new additions and expansion of existing facilities will be a discussion of funding and the city's portion of total costs. Both state and federal funds would be involved in many of the capacity-increasing proposals. Efforts will be made to identify that portion of the costs which most directly relates to the immediate urban population.

4. Review and Recommendations for Future Steps

As has been demonstrated, the various approaches to determining the relationship between land use, density and transportation suffer not from logical or operational weakness, but primarily from data deficiencies. The recommendations that will be made here center upon obtaining the necessary data. Problems encountered in each section will be reviewed and followed by recommendations for overcoming those problems.

a. 1. Traffic Generation

(1) The Method of Standards

(a) Review

The method of standards is an accurate and relatively simple means of determining trip generation. It is both flexible with regard to levels of detail of analysis, and has the advantage of having been employed in other studies which provide a basis for comparison. The major weaknesses are that standards for all modes and trip characteristics do not exist, nor are there standards which sufficiently distinguish between levels of development of land use.

(b) Recommendations

A sufficient quantity and quality of data is necessary for the development of all standards. A survey of buildings for each land use covering low, medium and high intensity levels of development would be necessary to verify the standards used or to develop different standards.

(2) The Empirical Block Type Analysis

(a) Review

The empirical analysis using the 1965 data lacks in sufficient detail. If the study continues to adhere to a block type analysis approach, even a complete analysis of the DPATS and NCTDP data for all of the blocks in areas of San Francisco covered in those studies would not provide for the needs of

this analysis. That is not to say that the data are insufficient for the purposes of those studies, but for this effort it is inadequate. The approach lacks further in that it requires currently inaccessible 1965 land use data. It is possible that sufficiently detailed data will be found, but this has not been the experience thus far. Finally, the data was collected in 1965 and current conditions are not necessarily reflected.

(b) Recommendations

This approach fits in well with the block type strategy being considered for future scenarios, but the basic problem of relating block types to travel cannot be overcome. Should the study continue to adhere to the block type strategy rather than a land use orientation, a survey of land uses similar to that suggested for the method of standards should be undertaken. Block levels of aggregation could then be conducted to determine traffic generation for block types. It is not recommended that the DPATS and NCTDP data be depended upon for this purpose, but can be used as an alternative method.

(3) BART Impacts

Few recommendations can be made for determining the mode diversion rates that BART will have. BART will be making its own estimates before June 1973 and the study should adopt these estimates when they are available.

b. 2. Traffic Volumes and Flows

The methods proposed for incremental increases in flows should prove to be sufficient. Other methods of allocation would require too large a project design.

The method of analysis that has been proposed is simple but efficient as a means of estimation. Refinement of ratios for differences in general street conditions, such as one-way, versus two-way streets can be made and will continue to be experimented with. It is not clear that such refinement will substantially improve the estimates of capacity, however.

c. 3. Costs of Changes in Transportation Demands

Given the scope of this study, the means of estimating the costs of maintaining an efficient transportation system should be adequate. A comprehensive study would be required for a detailed analysis or a subjective estimate of high-rise related cost could be undertaken.

d. Objectivity and Feasibility of Study

The findings of the transportation section of the study are expected to be both objective and reproducible for the city of San Francisco. The approaches, if the previously stated recommendations are followed, will be based upon a current data, and should thus be both reproducible and relatively objective. Several of the methods have not been employed previously and do not have the claim to objectivity that previously tested methodologies might have, but these methods have been constructed with objectivity as a goal. In a few areas, the subjective opinion of the analyst is required, however, as in the allocation of volume of traffic. This influence should prove to be minimal, however. No more than 25% of this portion of the study will be influenced by subjectivity.

I would hope more than that

Nothing compares with Good judgment

With respect to the final study feasibility, the goals of determining the relationship between land use and density, and transportation will be realized if the recommendations are followed. The influence of the subjective opinion of the analyst is minimal and controlled while the final results are based on current, accurate data.

Could be less of proportion more to impact of high rise (incl. [illegible]).

APPENDIX

SECTION IV
URBAN ECONOMICS

CHAPTER C
TRANSPORTATION

APPENDIX CI-1

BUILDING SURVEY

The Department of Housing and Urban Development and the San Francisco Planning and Urban Renewal Association in conjunction with the firm of Larry Smith & Company, Inc., are undertaking a study to determine the impacts of high-rise development upon the urban community. Important areas of concern are the contributions to traffic congestion and the lengthening of the peak morning and afternoon periods of highway and street congestion.

You can help in our efforts by answering a few simple questions regarding your travel habits to and from work. No name is required and your answers will be held in strict confidence.

A. How did you come to work? (Mode of transport, check appropriate answer)

1. Auto-driver ____
2. Auto-passenger ____
3. Bus or streetcar ____
4. Taxi ____
5. Truck ____
6. Walk ____
7. Other ____

B. When did you leave for work this morning? ____________________

C. Where did you start from? (City, County and Zip Code)

____

D. When did you arrive at work? ____________________

E. Did you park in this building? (Answer only if you came in an auto, check appropriate answer)

Yes ____ No ____

If no, how many minutes did it take to walk to work from where you parked? __________

F. Are you a full-time worker, part-time worker or officer of a firm? (Check appropriate answer)

1. Full-time ____
2. Part-time ____
3. Officer ____

Please return to receptionist when completed.

Cost of printing this page?

APPENDIX CI-2

SURVEY ORIGIN/DESTINATION ZONES

North Bay

94901
94903
94904
94920
94925
94930
94934
94939
94941
94947
94957
94960
94964
95965

San Francisco

94104 - Zone 1
94105
94111
94108
94109
94133

94115 - Zone 2
94118
94121
94123
94129

94112 - Zone 3
94114
94116
94117
94122
94127
94131
94132

94102 - Zone 4
94103
94107
94110
94124
94134
94135

Peninsula

94002
94005
94010
94014
94015
94019
94022
94025
94030
94035
94040
94044
94054
94061
94062
94063
94065
94066
94070
94080
94086
94087
94301
94303
94304
94305
94306
94401
94402
94403
94404
95002
95008
95014
95020
95030
95035
95037
95050
95051
95053
95070
95110
95111
95112
95113
95116
95117

Peninsula (Contd.)

95118
95119
95120
95121
95122
95123
95124
95125
95126
95127
95128
95129
95130
95131
95132
95133
95135
95137
95138
95139
95142

East Bay

94501
94507
94509
94517
94520
94521
94523
94525
94526
94528
94530
94531
94536
94538
94541
94542
94544
94545
94546
94547
94549
94550

APPENDIX CI-2 (continued)

SURVEY ORIGIN/DESTINATION ZONES (Continued)

East Bay (Contd.)

94553
94556
94560
94561
94563
94564
94565
94566
94569
94572
94575
94578
94579
94580
94583
94586
94587
94595
94596
94598
94601
94602
94603
94605
94606
94607
94608
94609
94610
94611
94612
94614
94618
94619
94621
94625
94702
94703
94704
94705
94706
94707
94708
94710
94720

East Bay

94801
94803
94804
94805
94806

APPENDIX CII-1

NON-PEAK HOUR STREET CAPACITIES

Streets	No. of Lanes	Two-Way Capacities (Vehicles Per Hour)
Pine	3	3,600
Bush	3	3,600
Battery	3	3,600
First	4	4,800
Third	4	4,800
Fourth	4	4,800
Fifth	2	2,400
Sixth	4	4,800
Fremont	3	3,600
Main	3	3,600
Seventh	4	4,800
Eighth	4	4,800
Ninth	4	4,800
Tenth	4	4,800
Post	3	3,600
Sutter	3	3,600
Valencia	2	1,000
Larkin	3	3,600
Hyde	3	3,600
Jones	3	3,600
Taylor	3	3,600
Powell	4	4,800
Haight	2	4,800
Union	2	4,800
O'Farrell	3	3,600
4th Avenue	2	2,400
Polk	2	2,400
Lincoln Way	4	4,800
Embarcadero	4	4,800
Bryant	3	3,600
I-280	6	12,000
Bayshore	4	8,000
Alemany	4	4,800
Taraval	4	4,800
7th Avenue	2	2,400
19th Avenue	6	7,200
Sunset Blvd.	4	4,800
James Lick Freeway	6	12,000
Army	6	7,200
17th St.	4	2,000
Diamond	2	1,000
Castro	2	1,000
Broadway	4	4,800
California	4	4,800

APPENDIX CII-1 (continued)

NON-PEAK HOUR STREET CAPACITIES (Contd.)

Streets	No. of Lanes	Two-Way Capacities (Vehicles Per Hour)
Fillmore	4	4,800
Divisidero	2	2,400
Fulton	4	4,800
Lincoln Blvd.	2	1,000
Fell	2	2,400
Oak	2	2,400
Masonic	4	4,800
Stanyan	4	4,800
Montgomery	3	3,600
Kearney	3	3,600
Geary	4	4,800
Bay	4	4,800
Lombard	4	4,800
19th Street	3	3,600
Geneva	4	4,800
Lake Merced	2	2,400
Stockton	4	4,800
Mission	4	4,800
Guerrero	4	4,800
Dolores	4	4,800
O'Shaughnessy	2	1,000
Sloat	4	4,800
Franklin	4	4,800
Gough	4	4,800
Columbus	4	4,800
Market	4	4,800
Portola	4	4,800
Monterey	4	2,000
Junipero Serra	4	4,800
Ocean	4	4,800
Van Ness	6	7,200
Golden Gate Bridge	6	12,000
Oakland Bay Bridge	12	24,000

APPENDIX CII-2

PEAK HOUR STREET CAPACITIES

Street	No. of Lanes	Two-Way Capacities (Vehicles Per Hour)
Pine	3	900
Bush	3	900
Battery	3	900
First	4	1,200
Third	4	1,200
Fourth	4	1,200
Fifth	2	600
Sixth	4	1,200
Fremont	3	900
Main	3	900
Seventh	4	1,200
Eighth	4	1,200
Ninth	4	1,200
Tenth	4	1,200
Post	3	900
Sutter	3	900
Valencia	2	1,000
Larkin	3	900
Hyde	3	900
Jones	3	900
Taylor	3	900
Powell	4	1,200
Haight	2	600
Union	2	600
O'Farrell	3	900
4th Avenue	2	1,000
Polk	2	1,000
Lincoln Way	4	1,200
Embarcadero	4	1,200
Bryant	3	900
I-280	6	10,800
Bayshore	4	7,200
Alemany	4	1,200
Taravel	4	1,200
7th Avenue	2	600
19th Avenue	6	10,800
Sunset Blvd.	4	1,200
James Lick Freeway	6	10,800
Army	6	1,800
17th St.	4	2,000
Diamond	2	1,000
Castro	2	1,000
Broadway	4	1,200
California	4	1,200

APPENDIX CII-2 (continued)

PEAK HOUR STREET CAPACITIES (Contd.)

Street	No. of Lanes	Two-Way Capacities (Vehicles Per Hour)
Fillmore	4	1,200
Divisidero	2	600
Fulton	4	1,200
Lincoln Blvd.	2	1,000
Fell	2	600
Oak	2	600
Masonic	4	1,200
Stanyan	4	2,000
Montgomery	3	900
Kearney	3	900
Geary	4	1,200
Bay	4	1,200
Lombard	4	1,200
19th Street	3	900
Geneva	4	1,200
Lake Merced	2	600
Stockton	4	1,200
Mission	4	1,200
Guerrero	4	1,200
Dolores	4	1,200
O'Shaughnessy	2	1,000
Sloat	4	1,200
Franklin	4	1,200
Gough	4	1,200
Columbus	4	1,200
Portola	4	1,200
Monterey	4	2,000
Junipero Serra	4	1,200
Ocean	4	1,200
Van Ness	6	1,800
Golden Gate Bridge	6	10,800
Oakland Bay Bridge	6	10,800
Market	4	1,200

APPENDIX CIII-1

PERCENTAGE AREAL DISTRIBUTION OF SAMPLE BLOCKS

Block 3730 Origin Zone	Parked In Block	Parked In Other Block	Primary Destination In Block	Destination In Other Block
San Francisco				
Zones 1	4.5%	0%	3.0%	8%
2	3.5	6	4.0	2
3	2.0	4	2.0	3
4	11.5	9	11.0	9
5	2.0	4	3.0	2
6	1.0	0	1.0	3
7	3.0	6	2.5	6
8	8.0	13	9.0	4
9	16.0	7	14.2	14
10	5.5	4	6.0	2
11	0.6	1	0.5	3
12	3.0	1	2.5	5
13	2.0	4	3.0	2
14	2.0	1	3.0	1
15	1.4	0	1.3	4
Other San Francisco	0.5	0	0.5	0
Total San Francisco	66.5%	60%	66.5%	68%
Peninsula	18.0	22	17.0	19
East Bay	10.0	17	11.0	10
Marin/North Bay	4.0	1	4.0	2
Out of State	1.5	0	1.5	1
Grand Total	100.0%	100.0%	100.0%	100.0%

APPENDIX CIII-2

PERCENTAGE AREAL DISTRIBUTION OF SAMPLE BLOCKS

Block 308 Origin Zone	Parked In Block	Parked In Other Block	Primary Destination In Block	Destination In Other Block
San Francisco				
Zones 1	5.8%	4.2%	5.6%	5.9%
2	7.2	7.6	7.4	7.2
3	5.8	5.6	5.6	6.2
4	6.8	13.0	9.5	7.1
5	2.3	3.4	3.0	2.1
6	0.8	1.0	0.7	0.7
7	1.2	1.2	1.0	1.3
8	0.7	1.7	1.2	0.5
9	0.8	1.2	0.7	0.9
10	0.9	0.3	0.4	1.0
11	0.2	0.5	0.4	0.3
12	0.6	1.0	0.7	0.7
13	2.5	3.4	2.5	2.8
14	1.7	3.2	2.5	1.8
15	2.3	3.2	2.6	2.4
Other San Francisco	0.7	0.3	0.2	0.8
Total San Francisco	40.3%	50.8%	44.0%	41.7%
Peninsula	21.8	17.9	18.8	20.7
East Bay	24.9	19.4	23.8	27.2
Marin/North Bay	12.2	11.6	13.2	9.7
Out of State	0.8	0.3	0.2	0.7
Grand Total	100.0%	100.0%	100.0%	100.0%

APPENDIX CIII-3

PERCENTAGE AREAL DISTRIBUTION OF SAMPLE BLOCKS

Block 764 Origin Zone	Parked In Block	Parked In Other Block	Primary Destination In Block	Destination In Other Block
San Francisco				
Zones 1	5.4%	4.0%	4.8%	5.8%
2	3.5	3.1	3.6	2.9
3	7.0	6.3	7.2	5.8
4	20.8	16.4	19.1	23.3
5	5.9	4.2	5.5	0
6	3.8	1.5	2.5	0
7	1.6	1.6	1.8	2.9
8	3.3	3.3	3.5	5.8
9	1.6	2.1	2.2	1.4
10	4.0	1.5	2.6	2.9
11	0.8	0.7	0.8	1.4
12	2.8	1.3	2.0	2.9
13	4.1	3.8	4.3	1.4
14	0.9	2.5	2.1	2.9
15	1.3	2.8	2.8	0
Other San Francisco	1.1	0.6	0.7	1.4
Total San Francisco	67.9%	55.7%	65.5%	60.8%
Peninsula	11.9	17.5	7.6	14.6
East Bay	17.8	19.3	20.0	21.7
Marin/North Bay	2.4	7.4	6.8	2.9
Out of State	0	0.1	0.1	0
Grand Total	100.0%	100.0%	100.0%	100.0%

APPENDIX CIII-4

PERCENTAGE AREAL DISTRIBUTION OF SAMPLE BLOCKS

Block 240 Origin Zone	Parked In Block	Parked In Other Block	Primary Destination In Block	Destination In Other Block
San Francisco				
Zones 1	3.2%	6.0%	4.1%	2.9%
2	4.7	6.0	5.4	3.9
3	16.3	8.4	15.6	15.2
4	28.8	14.4	21.4	32.1
5	2.3	2.3	2.6	3.9
6	0.5	1.5	0.9	0.5
7	0.8	1.5	0.8	1.4
8	1.1	1.5	1.1	1.4
9	1.4	2.3	1.6	1.4
10	0.3	1.5	0.8	0.5
11	0.1	0	0.1	0
12	0.6	0.4	0.1	1.4
13	2.3	2.8	2.4	1.9
14	1.8	2.3	1.8	2.4
15	1.4	2.9	1.3	2.9
Other San Francisco	0	0	0	0
Total San Francisco	65.6%	53.8%	60.0%	71.8%
Peninsula	12.3	20.5	15.6	10.2
East Bay	13.4	14.4	14.3	11.7
Marin/North Bay	8.7	11.3	10.1	6.3
Out of State	0	0	0	0
Grand Total	100.0%	100.0%	100.0%	100.0%

APPENDIX CIII-5

PERCENTAGE AREAL DISTRIBUTION OF SAMPLE BLOCKS

Block 325 Origin Zone	Parked In Block	Parked In Other Block	Primary Destination In Block	Destination In Other Block
San Francisco				
Zones 1	1.8%	4.6%	2.7%	3.4%
2	2.2	3.0	2.7	1.7
3	8.1	8.0	8.1	6.7
4	35.1	16.4	28.5	25.5
5	3.9	5.3	4.3	5.1
6	.8	2.1	1.3	0
7	.8	1.9	1.1	3.4
8	1.5	2.7	2.1	1.7
9	2.3	1.5	2.1	1.7
10	1.1	1.9	1.3	0
11	.2	0	.3	0
12	.7	1.2	.8	3.4
13	1.1	2.1	1.4	1.7
14	.7	2.4	.9	3.4
15	.7	2.8	1.3	0
Other San Francisco	.5	.4	.3	1.7
Total San Francisco	61.5%	56.3%	59.2%	59.4%
Peninsula	22.5	20.7	22.2	25.4
East Bay	12.3	16.3	13.9	8.4
Marin/North Bay	2.3	6.1	3.4	6.8
Out of State	1.4	.6	1.3	0
Grand Total	100.0%	100.0%	100.0%	100.0%

APPENDIX CIII-6

PERCENTAGE AREAL DISTRIBUTION OF SAMPLE BLOCKS

Block 336 Origin Zone	Parked In Block	Parked In Other Block	Primary Destination In Block	Destination In Other Block
San Francisco				
Zones 1	3.4%	7.3%	5.7%	2.6%
2	7.2	4.4	5.1	10.6
3	5.9	8.6	6.3	5.4
4	23.7	40.5	36.0	12.0
5	8.3	7.3	6.8	12.0
6	3.4	1.5	2.8	4.0
7	1.5	1.5	1.7	1.4
8	3.4	2.8	3.5	4.0
9	.9	2.8	1.2	2.6
10	3.4	4.4	4.5	1.4
11	.5	1.5	1.2	0
12	.5	1.5	.5	0
13	1.9	0	1.2	2.6
14	.9	2.8	1.7	1.4
15	3.4	1.5	2.2	5.4
Other San Francisco	0	0	0	0
Total San Francisco	68.3%	88.4%	80.4%	65.4%
Peninsula	16.1	8.6	13.7	14.6
East Bay	7.8	1.5	4.2	12.0
Marin/North Bay	7.3	1.5	1.7	6.6
Out of State	.5	0	0	1.4
Grand Total	100.0%	100.0%	100.0%	100.0%

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D. HOUSING AND LAND USE

1. Introduction

The aim of this section is to explore some of the ways in which high intensity development in downtown San Francisco affects residential neighborhoods throughout the city. The broad conceptual model upon which our investigation is built has several parts.

First, as high-rise office buildings are constructed in the downtown, the nature and level of downtown employment changes. In the second step of the model, a portion of the additional employers present in the downtown will seek housing within San Francisco. Because of certain characteristics of these employees, they will seek housing in certain neighborhoods rather than others. Not all neighborhoods will be equally affected. In the third step, additional demand for housing in neighborhoods can have one or several of the following effects: (1) Rents increase as new residence seekers compete for space in the existing stock of housing units; (2) House values increase as a result of both increased demand for the housing units and increased probability that the housing unit can be demolished and rebuilt at a higher density; and (3) New construction at a higher density occurs in response to increased demand and higher rents.

The operation of these pervasive economic forces results in a change in the character of the affected neighborhoods. At the first level, the demographic character of the neighborhood may change. The new residents may have demographic characteristics that differ significantly from the previous residents in terms of age, family size, income, profession, ethnic identification and so on. The new residents may directly displace previous residents unable to compete with the higher rents paid by the newcomers, or the new residents may be a pure addition, inhabitating new housing on previously less densely developed land. Existing trends in the neighborhood may be strengthened, i.e. a predominantly renter neighborhood may become even more so; or entirely new trends may be introduced, i.e., single persons replacing families. If the effect is strong enough, that is to say, if the number of new residents is large compared with the number of previous residents and if the new residents do differ significantly in demographic terms from the previous residents, the phenomenon known as "neighborhood turn-around" might emerge.

A second result of the process that began with employment changes in the downtown might be what has been called the "ripple-out" effect. As employment goes up in the downtown, rents go up in the neighborhoods. The increased rents in the neighborhoods imply an increase in the value of existing housing units and in the value of the land upon

which the housing stands. This phenomenon, if it can be shown to exist, would have different effects upon different persons. For the property owner, it means higher taxes for as long as he holds the property, but a greater gross return on his initial purchase price, if and when he sells. For the renter, it essentially means higher rents and--unless compensated from other sources such as salary increases or tax relief--a net decrease in his standard of living. For the city, it means increased property tax collections. This revenue increase may or may not be offset by different costs and demands for city services, such as schools, police, etc. In any event, the issue is the subject of another section of this report.

A third result that might be traced back to the employment changes downtown is a change in the physical form of the neighborhoods. Increased demands for space and increased rentals being offered make demolition of existing housing and rebuilding at a higher density profitable for a private developer. At the first density level this could mean, for example, the demolition of single-family homes to be replaced by multi-family structures. At higher levels this could mean demolition of medium density multi-family structures with high density multi-family structures--in other words, the emergence of residential high-rise.

Since this is an impact study in a particular city, the problem that faces us is not whether the foregoing process is theoretically possible, but whether it has in fact occurred in San Francisco, or will occur, and in quantitative terms, how significant it may be. There are many powerful forces not directly related to employment changes and high-rise commercial construction that powerfully influence each of the variables discussed in the foregoing paragraphs. Housing prices and rents are affected by changes in construction costs, tax policies, and interest rate fluctuations. Housing demand in the city is affected by changes in per capita income, access to new residential opportunities elsewhere in the Bay Area, minority exclusion practices, and changes in consumer tastes. Demographic character, also related to housing demand, is affected by apparently autonomous trends in family size and birth rates, medical advances, and changing technology in the industries that constitute the job market. Many other factors could be adduced, but these suffice to make the point. Other factors whose effects we do know about in some detail, may be so powerful that the hypothesized linkage of neighborhood character to high-rise commercial construction is very weak if not undetectable. The strength of the linkage is one of the primary determinants of its practical significance to a public policy maker faced with decisions concerning the future of San Francisco's downtown.

Our task in Step 1 - Part B has been to gather evidence of the existence of our hypothesized relationships and test the feasibility of producing reliable, quantitative estimates of their significance. These estimates, in turn, would be used as a guide for forecasting neighborhood impacts of downtown commercial alternatives in later phases of this study. The following sub-sections of this chapter report our results to date.

Section 2 below discusses the basic question--where high-rise employees choose to live within San Francisco. We encountered several basic data difficulties in attempting to do a time series analysis--in other words, following employee residence choices over time. However, we were able to develop cross-sectional data on residential choice in 1970 and from that, make some inferences about the changes over time. That section discusses our results and describes a few additional steps that we will take in order to obtain more refined results in the next phase of the study. In general, our conclusion is that the neighborhood choices of high-rise employees can be fairly accurately predicted on the basis of a small number of variables such as access, income, sex, race, and occupation.

Section 3 below goes into the effects of residential choice decisions on the key variables of housing value, rents, and construction activity. The analysis in this section is more complex because time series analysis is almost indispensible in order to control the effects of the many other variables that influence these economic impacts. In many of the neighborhoods we examined, the results were generally consistent with our hypothesis. Increased CBD employment in those neighborhoods does not appear to be associated with housing price increases and construction activity. In others there remains a great deal of unexplained variance. We describe the steps that we will take to extend this analysis through the adoption of a more sophisticated technique and present the results of an initial test of that method.

Section 4 below carries the implications of the results of the preceding section through to their role in determining the emergence of high-rise residential buildings. The approach that is taken is an examination of the way in which changing demand levels for housing units influence the economic feasibility of new high-rise residential construction. In tracing out the interaction of demand--and the housing prices or rents associated with that demand--with the other variables that determine economic feasibility of big-rise residential buildings, we obtain several insights that will be of use in constructing development alternatives for San Francisco that are

realistic. Expressed differently, the understanding we gain of developer response to economic incentives helps us to determine some of the likely consequences of policy controls on high-rise construction. These basic results will be further developed in later phases of the study when policy alternatives are the explicit objectives. Our preliminary analysis of the data base collected in I-B implies that developer responses to the kinds of controls that we will be considering can be feasibly forecast.

TABLE D-1

DISTRIBUTION OF PLACE OF WORK
BY PLACE OF RESIDENCE
SAN FRANCISCO SMSA
1960 - 1970

1960

County of Employment	County of Residence: San Francisco	Alameda	Contra Costa	Marin	San Mateo	Outside SMSA
San Francisco	93.0%	7.1%	7.1%	33.9%	33.2%	2.7%
Alameda	1.7%	87.2%	24.7%	1.3%	1.3%	.8%
Contra Costa	.2%	2.3%	64.7%	1.0%	.1%	.5%
Marin	.5%	.2%	.3%	61.1%	.1%	.9%
San Mateo	3.4%	.8%	.3%	.4%	56.2%	4.0%
Outside SMSA	1.2%	2.4%	2.9%	2.3%	9.1%	91.3%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total Employed Residents	336,596	345,355	140,761	55,465	172,657	346,681

1970

	San Francisco	Alameda	Contra Costa	Marin	San Mateo	Outside SMSA
San Francisco	89.5%	9.7%	10.4%	38.4%	29.3%	3.0%
Alameda	2.5%	81.3%	24.3%	2.6%	1.6%	1.2%
Contra Costa	.4%	3.0%	61.2%	1.1%	.2%	1.0%
Marin	.5%	.2%	.5%	52.1%	.1%	1.0%
San Mateo	5.7%	2.4%	1.4%	2.6%	59.0¢	4.8%
Outside SMSA	1.8%	3.3%	3.8%	3.2%	9.8%	86.4%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total Employed Residents	318,741	558,960	207,357	82,333	235,706	561,781

Source: U.S. Census
Keyser/Marston & Associates

2. Residential Choice

The aim of the Residential Choice section of this report is to test our ability to predict where in San Francisco the future employees of downtown high-rise office buildings would generally want to live. Once we can determine where they would want to live, we will be able to deal with the question of the impact of their demand on the city's residential neighborhoods.

From our research on the best way to accomplish our objective of predicting residential choice, we concluded that we had an excellent data source in the 1970 Census which contains a wealth of information on population by place of residence. In particular, the 1970 Census, for the first time, included a data series on "Place of Work, San Francisco CBD." With data readily available on where the present CBD workers live, we are able to test the validity of correlating selected characteristics of residents in San Francisco neighborhoods with characteristics of CBD or high-rise office building employees. Because of poor data availability on the characteristics of CBD or high-rise office employees, we had to make some assumptions in order to test the methodology and have proposed means of obtaining data on high-rise employees for the next phase of the study.

In performing a cross-sectional analysis, we are able to identify the major determinants of residential choice. If we know where and why most existing high-rise office employees live where they do, we believe we can say with a reasonable amount of accuracy where future employees will generally want to live. Whether or not future employees will be able to locate housing in their preferred place of residence or whether they will be able to afford the housing if they find it are separate questions. In the context of real estate analysis, the demand will be there; if it cannot be satisfied in that location, it will be shifted to some other location and for the most part other locations will be quite predictable. Thus, in analyzing San Francisco residential neighborhoods at one point in time, we can have a good understanding of where demand generated by high-rise office employees is apt to be located among the San Francisco residential choices.

We would ultimately like to be able to say that for every 10,000 new jobs generated in new CBD office buildings we can predict the relative magnitude of housing demand in the Marina, in the Richmond, etc. In order to accomplish this, it is desirable to have an understanding of the regional commuter distribution in the CBD, using the U.S. Census data base, so that the findings in this portion of the study can be corroborated with those in the Transportation and Downtown employment portions of the study which also treat commuter patterns, but use a different data base.

In this portion of the study we need to carefully distinguish CBD commuter patterns from commuter patterns for the city overall; however, many of the data sources used in other portions of the study do not make the distinction. Most important is the necessity to understand the San Francisco-non-San Francisco commuter distribution on a incremental basis, which is not possible from the BATSC home interview survey conducted at one point in time. For example, the Census tells us that approximately 55% of the 1970 CBD workers lived in San Francisco, but we suspected that 55% of all new CBD workers would not desire to live in San Francisco, and our analysis of 1960 and 1970 Census material presented subsequently confirmed our suspicions.

The first sub-section, therefore, contains a brief investigation, using readily available Census material, into San Francisco's position in the regional context over the last decade. We review employment changes in the city and how they are related to residential population composition. Finally, we are able to estimate on an initial basis the residential distribution of CBD employment growth and we suggest ways in which these estimates can be refined and used with data prepared in other portions of this study. The second sub-section deals with the question of residential choice among San Francisco neighborhoods and contains a discussion of the methodology, data sources, and initial findings contained therein.

a. San Francisco Residence in the Regional Context

(1) Introduction

This section contains a review of 1960 and 1970 Census data on the City of San Francisco and the CBD in relation to the SMSA in order to determine changing commutation patterns over time. The changing commutation patterns are briefly reviewed in light of the changing industrial and occupational composition in San Francisco overall and in the CBD. This section gives us the opportunity of comparing U.S. Census findings with the material prepared in the BATSC study and with that published by the State of California Department of Human Resources Development (HRD).

(2) Regional Commuting Patterns to the City of San Francisco

In both the 1960 and 1970 Census, data has been collected and published on place of work by city and county. Since all Census material is recorded by place of residence, the Census provides a good basis for understanding work commutation patterns within a metropolitan area, or SMSA.

Commutation in and out of SMSA confines is available through special Census tabulation (locally, the material may be purchased from the Census Service Facility at the University of California in Berkeley). For the purpose of this phase of the report, however, we feel that reasonable estimates have been made possible through publication of 1960 material in Wallace F. Smith's book, Housing Market Data from Census Material, prepared for the Real Estate Program of the University of California at Berkeley in 1963, and a special tabulation in Santa Clara County prepared for another company study.

Based on the estamates for persons working in San Francisco from outside the SMSA, it is possible to construct a matrix of commutation for the SMSA for 1960 and 1970. These matrices, presented in percentage form in the table opposite, demonstrate where the residents of the SMSA counties worked during the censal years and, thus, the change over the decade. The key points that the two matrices tell us are:

(a) That a smaller share of total San Francisco residents now work in San Francisco than did in 1960, a percentage decrease of roughly 3% (or conversely, there was a 3% increase of out-commuting among San San Francisco residents). Since the total work force decreased in actual numbers as well, the decrease is even greater than the percentage would indicate, or about 29,000 less employed residents of the city worked in the city in 1970 than in 1960.

(b) That in Alameda, Contra Costa, Marin and Non-SMSA counties, the share of the total work force employed in San Francisco increased over the decade. In these counties, there was a consistent decrease in the share of total employment working in the county of residence, despite major industrial parks and other employment centers developed in most of these areas over the decade. Interestingly, the data runs quite counter to the claim made on behalf of most of these areas that they are moving toward economic independence by creating an employment base of their own. On the contrary, the Census commutation data would suggest further interdependence among the Bay Area counties.

(c) The only county where the share of residents employed in San Francisco has dropped percentage wise is San Mateo County. Correspondingly, it is the only county which showed an increase in the share of employed residents working within the county, and the only county to show consistent increases as a place of employment for all counties across the board. (Interestingly, San Mateo County was the first San Francisco suburban county to be developed on a large scale, perhaps suggesting a longer term pattern of suburban development.) In actual numbers, however, the number of San Mateo residents working in San Francisco has shown a significant increase as will be demonstrated subsequently.

For the purposes of this study, our interest in commuter patterns focuses on the subject of where people who work in San Francisco live. We would like to know where they have lived in the past and where they are living now with the objective of being able to have a better

TABLE D-2

SAN FRANCISCO EMPLOYMENT
PLACE OF RESIDENCE
1960 - 1970

	1960	1970	1960-1970 Change Numerical	Percent
San Francisco	313,600	284,000	-29,600	-9.4%
Alameda	24,690	38,090	13,390	54.2%
Contra Costa	9,960	21,770	11,810	118.6%
Marin	18,620	31,700	13,070	70.2%
San Mateo	57,180	69,060	11,910	20.8%
Outside SMSA	9,100**	22,500*	13,400	147.2%
Santa Clara		15,000*		
Solano		3,000*		
Napa		1,000*		
Sonoma		3,500*		
Total	433,150	467,500	34,350	7.9%
Total Excluding S.F.	119,550	183,500	63,950	53.5%

PERCENT DISTRIBUTION

	1960	1970	Change
San Francisco	72.4%	61.1%	-11.3%
Alameda	5.7%	8.2%	2.5%
Contra Costa	2.3%	4.4%	2.1%
Marin	4.3%	6.8%	2.5%
San Mateo	13.2%	14.8%	1.6%
Outside SMSA	2.1%	4.6%	2.5%
Santa Clara	1.5%	3.2%	1.7%
Solano	.1%	.6%	.5%
Napa	.1%	.2%	.1%
Sonoma	.4%	.7%	.3%
	100.0%	100.0%	-

* Estimated by Keyser/Marston & Associates;
Santa Clara County estimated from special Census tabulation

** Wallace F. Smith, Housing Market Data from Census Materials Research Report 21

Source: U.S. Census
Keyser/Marston & Associates

understanding of where they will live in the future. Table D-2 presents a summary of where persons employed in San Francisco resided in 1960 and 1970, and the change over the ten years. The data tells us:

(a) That the number of San Francisco residents employed in San Francisco decreased by nearly 30,000 persons over the decade, such that in 1970 San Francisco residents comprised 61% of the work force instead of 72% in 1960.

(b) That the number of in commuters from Alameda, Contra Costa, Marin and San Mateo, and the four outside SMSA counties all increased numerically by roughly 12,000 to 13,000 each. In percentage terms, the increases for the individual counties ranged from nearly 150% for the outside SMSA counties (primarily Santa Clara) to 20% for San Mateo.

(c) That the total employment in San Francisco increased by 34,350, or by 8%, while the total in-commuting employment increased by 63,500, or an increase of 53%, or by nearly twice as much numerically.

From the above, it may be concluded for every San Francisco resident who left a job in San Francisco for a job outside the city, roughly two new jobs were created for commuters. The foregoing need not imply any causal relationship, rather it establishes only a numerical relationship over the past decade.

The data compiled by the BATSC study in 1965, which was subsequently used by the San Francisco Planning Department as a basis for the City Transportation Plan, produced some significantly different conclusions regarding growth in commutation patterns. The BATSC analysis used the 1960 Census as a base and then applied growth indicators to establish 1965 levels. The BATSC data, shown in comparison with the Census data in Table D-3, should on a very rough basis appear half way between the Census years. Actually, the State of California Human Resources Development data indicates that over 60% of the decade employment growth was after 1965, and, thus, one could assume the BATSC levels should be less than midway between the Census levels. The most pronounced disagreement is in the commuting levels for Alameda and San

TABLE D-3

U.S. CENSUS VS. BATSC DATA
PERSONS EMPLOYED IN SAN FRANCISCO
1960, 1965, 1970

Place of Residence	1960 Census*	1965 BATSC	1970 Census*
San Francisco	313,600	289,684	284,000
Alameda	24,690	43,960	38,090
Contra Costa	9,960	21,179	21,770
Marin	18,620	27,170	31,700
San Mateo	57,180	75,670	69,060
Santa Clara	8,660	13,200	15,000**
Sonoma		2,730	3,000**
Napa & Solano	440	2,850	4,500**
Total	433,148	476,443	467,500
Total excluding S.F.	119,550	186,759	183,500

* Levels are after adjustment for "Place of Work Not Reported"

** Estimated by Keyser/Marston & Associates

Source: U.S. Census (after adjustment for "Place of Work Not Reported". BATSC

Mateo counties, a result which is probably largely a function of the high population estimates for these counties in 1965 compared to the 1970 Census levels.

The differences between the two data sources raise two issues--one is the question of absolute levels, which is of lesser concern, and the other is one of relationships and indicates severe limitations of combining data sources to derive conclusions.

(3) Employment in the City of San Francisco

The Census material place of work tabulation has led to conclusions on the total level of employment in the city through addition of the commuting counties.

The most commonly used data on employment by place of work is that recorded by the individual state departments of labor, which are nationally coordinated by the U.S. Department of Labor. In California that agency is the Department of Human Resources Development (HRD). According to HRD, the 1960 and 1970 levels of employment compared as follows:

Employment in San Francisco

	1960	1970	1960-1970
U.S. Census	433,150	467,500	34,352
HRD	475,900	537,600	61,700

Again, we have some significant data differences. We have found substantial data discrepancies in other areas of California, some of them isolated counties, such as Humboldt, where total employment levels cannot be obscured by commuting between counties. According to persons contacted at HRD, some of the differences may be explained by the following reasons:

(a) The State data records the number of jobs, not the number of persons. Therefore, one person holding two jobs is counted twice in the State and only once in the Census data.

(b) The U.S. Census data is for April 1, 1970, whereas figures shown on the State table are annual averages.

(c) The U.S. Census is based on a 20% count sample, whereas the State data is based on reported employment with estimates made for certain categories.

(d) In the State data, an employer occasionally reports an employee who is working in another area. When HRD discovers such an occurrence, the data is corrected.

Of the above, only the first item could explain a major share of the difference. Since HRD is in the process of revising estimates for most areas to more closely correlate with the Census, we are not attempting to justify the two sources.

San Francisco Central Business District

U. S. Census Definition

A review of employment growth by industry, according to HRD, indicates that over 19,000 manufacturing and wholesaling jobs were lost in San Francisco over the decade, while nearly 42,000 jobs were gained in finance, insurance, and real estate and the government categories. Thus, the blue collar intensive industries are leaving San Francisco, while the white collar intensive industries are growing.

(4) Commutation to San Francisco's Central Business District

The 1970 Census provides a separate tabulation on the San Francisco Central Business District (CBD) as a place of work. The map opposite shows an outline of the area designated by the U.S. Census as the CBD (the area included within Census tracts 117, 121, 123, and 124). You may refer to the map in the next sub-section for an illustration of all the San Francisco Census tracts. For the most part, the Census definition is a very useful one in that it includes most of the financial district, the retail core around Union Square, and the Civic Center. The northern limit is Sacramento Street, therefore omitting the Golden Gateway/Embarcadero complex and a number of other major buildings. However, as it is the purpose of this analysis to establish relationships, we can probably assume that the employment structure and choice of residence of employees will be essentially the same in a downtown San Francisco office building, regardless of its location with respect to the Census's arbitrary boundary.

When the place of work in the San Francisco CBD data series is summarized for the individual counties of the San Francisco SMSA, the following results:

	Place of Work		
Residence	S.F. City	S.F. CBD	CBD as Share of City
San Francisco	284,000	91,160	32.1%
Alameda	38,090	14,650	38.5%
Contra Costa	21,770	10,990	50.5%
Marin	31,700	14,000	44.2%
San Mateo	69,060	21,680	31.4%
Outside SMSA	22,500*	12,530*	55.7%
Total	467,500	165,000	35.3%

* Estimated by Keyser/Marston & Associates. All other figures obtained from the U.S. Census after adjustments for "Place of Work Not Reported."

The above data tells us:

(a) That total CBD employment was approximately 165,000 at the time of the April, 1970 Census.

(b) That slightly under one third of the San Francisco residents working in San Francisco work in the CBD.

(c) That between 12,000 and 14,000 CBD employees live in each of the SMSA counties, except for San Mateo which has over 21,000 commuters to the CBD.

(d) That the CBD share of total San Francisco commuters is greatest for outside SMSA commuting counties. Our estimate is based on much published research which has determined that the geographically more distant the commuter, the greater the propensity of the commuter to work in the CBD.

In discussing work commutation to San Francisco outside the CBD, it is useful to keep in mind some of the major non-CBD employment concentrations, such as the U.C. Medical Center, educational institutions (e.g., San Francisco State College), large hospitals, civilian employment at military bases, and isolated buildings such as Fireman's Fund Insurance in the Richmond neighborhood. Other concentrations affecting the Census estimates are the Golden Gateway/Embarcadero Center and office space north of Sacramento Street, mentioned previously.

Ideally, we should have commutation to the CBD data prepared by the same source for two different points in time. Since no such data exists, and we have established that we cannot mix BATSC data with Census data, we must be able to deduce some reasonable estimates of how CBD employment is growing over time and what share of that growth are commuters from other counties versus San Francisco residents. Since change in employment in San Francisco over the last decade has been so markedly different for San Francisco residents (which declined by nearly 30,000) than for commuters (which grew by nearly 64,000), it is necessary to analyze and project them separately.

For commuters from outside San Francisco counties to the San Francisco CBD, we can establish a past trend by making assumptions using the Census materials shown previously. One way is to assume commutation to the CBD grew at the same rate as it did to the city of San Francisco overall,

or by 53% over the decade. Another is to take the share of total San Francisco employees working in the San Francisco CBD for individual counties and assume the increment over the decade was the same for the CBD as for the city overall. The former approach produces a commuting level of roughly 48,200 in 1960, while the second produces a slightly lower level of 45,700. Other arithmetical assumptions continue to produce answers in the range of 45,000 to 50,000 in-commuters to the CBD from outside counties in 1960, or an increase of from 24,000 to 29,000 new commuters between 1960 and 1970.

In future phases of the study, we may be able to obtain data from A/C Transit, Greyhound, and other commuter transportation to get an indication of increase over the decade. Additionally, we can most likely obtain traffic counts at the peak commuter hours during 1960 from these other sources and refine and cross-check our estimated levels.

Within San Francisco we must use a more indirect approach to estimate how many more residents worked in the CBD in 1970 than in 1960. From the Census material, it appears that the best indicator is a growth rate in those residents employed in office-type occupations, which has been about 17% (see Table D-10), thus enabling us to estimate on an initial basis that approximately 13,250 more San Francisco residents worked in the CBD in 1970 than in 1960. Our estimate for trends in CBD employment among San Francisco residents could be compared to data on MUNI riders within the city.

The assumptions made above would lead us to conclude that 1960 and 1970 levels were:

CBD Employment

	1960	1970	1960-1970
San Francisco Residents	77,910	91,160*	13,250
(percent)	(62%)	(55%)	(33%)
Non-San Francisco Residents			
(mid-point estimate)	47,000	73,840	26,840
(percent)	(38%)	(45%)	(67%)
Total	124,910	165,000	40,090

* U.S. Census

From the above, we can deduce that for every three net new jobs created in the CBD over the last decade, one was filled by a person who elected to live in San Francisco.

Possibly the best way to refine the relationship estimated above would be by means of a survey questionnaire of office workers. Since such a survey is one of the major proposed work items of the next phase of the residential portion of this study, further discussion is deferred to pages 178-180.

The estimate of CBD employment in 1960 and growth to 1970 indicates that total employment in the CBD grew by over 40,000 persons. Again, we are lacking readily available data from two different points in time to cross-check the estimate. On an initial basis, we can evaluate the estimate by saying that, at 200 sq. ft. per employee, eight million sq. ft. of net new floor space should have been added (using a standard office space ratio) over the decade. A summary of major office buildings completed over the period would confirm that our estimate is in a probable range--nine million sq. ft. were completed in major buildings in the CBD as defined by the Census, and we know that the net new space added was less than nine million sq. ft. We will be able to cross-check and coordinate our results with findings from the Transportation portion of this study.

One way in which CBD employment growth could be analyzed which should be highly accurate is through special tabulation of HRD data for 1960 and 1970. Since the data has been collected at the place of employment and reported to HRD, it is clear that the data does in fact exist. That no one as yet has extracted such data for any CBD (to our knowledge) may cause one to conclude that it would probably be a far more difficult task than the necessity for the information would warrant.

Based on initial tabulations on commutation by occupation from the Downtown Employment portion of this study, we can see that it will be possible to coordinate these findings with our work and from them be able to predict where new high-rise office workers will want to live by their occupation, sex, and other variables. Once we have established what portion of the workers will want to live in San Francisco, we can determine where in San Francisco they will want to live through use of the methodology tested in the next section.

b. Residential Choice Among San Francisco Neighborhoods

(1) Introduction

(a) Purpose

The purpose of this sub-section is to establish a methodology for determining where in San Francisco employees working in the CBD now live and why they have selected to live there. Our ultimate objective, of course, is to be able to predict where new employees of CBD high-rise office structures will want to live so that we can measure what impact their demand for housing will have on San Francisco residential neighborhoods. Given the fact that the vast majority of choices of housing are made from the already existing supply, if we can identify where and when demand will be greatest, we can identify where and when new construction can be expected to occur and, finally, predict where this construction might be high-rise.

(b) Methodology

The methodological approach that will be used to determine residential choice is a cross-sectional analysis of CBD employees and the residential areas at one point in time. We begin with the 1970 Census material on CBD commutation (which is only available for one point in time) as a given. Since the Census material is compiled by place of residence, the place of work "San Francisco CBD" data series describes the existing commutation pattern. The remainder of the analysis will try to establish why this pattern exists so that we can develop a context for identifying future residential preferences of CBD, or more particularly, high-rise office building workers.

For guidance on an approach to the question of why people choose to live where they do, we can refer to the existing literature on the subject. In this literature there is general agreement that access to jobs is a primary determinant, but clearly not the only one. In addition, a range of behavioral forces come into play, some more economic and some more sociological.

San Francisco Neighborhoods

1970 Census Tracts

1 RICHMOND
2 MARINA
3 NORTHEAST
4 DOWNTOWN
5 WESTERN ADDITION
6 BUENA VISTA
7 CENTRAL
8 MISSION
9 SOUTH OF MARKET
10 SOUTH BAYSHORE
11 BERNAL HEIGHTS
12 SOUTH CENTRAL
13 INGLESIDE
14 INNER SUNSET
15 OUTER SUNSET

Economic forces dictate the costs of housing versus the amount of living space provided at various distances from the place of work, while the more sociological forces deal with the propensity of people to try to live in places where their neighbors will be most like themselves in terms of income, race, occupation, etc. In other words, CBD employees will generally want to live where the existing residents have similar income and occupational characteristics. In order to accomplish an identification of residential areas similar to CBD employees, we must first educate ourselves about CBD employees and compare their characteristics with those of residential neighborhoods.

(c) Analysis Areas

As a starting point, the 15 neighborhoods of San Francisco established by the City Planning Department have been used as the basic units of analysis for this phase of the study. The map opposite illustrates the designated neighborhood areas and appendix tables provide codes for aggregating 1960 and 1970 tracts accordingly. As will become evident, the large size of some of the neighborhoods builds in some weakness in the relationships we will observe by obscuring special characteristics of some smaller portions of the area. For example, the neighborhood definition of the Western Addition which is predominantly a low-income Black area, also contains several middle-income White neighborhoods far more akin to the Richmond. The Northeast neighborhood, which contains the full income spectrum from Nob Hill to Chinatown, is so heterogeneous we would anticipate difficulties even at the tract level.

On the whole, however, a far more accurate analysis could be performed on the Census tract level or by using smaller aggregations of tracts. Due to the large number of data entries involved, analysis at the tract level would require computer handling.

(d) Data Sources

In general, the Census provides an excellent data base for describing "place of residence" characteristics on either the neighborhood or tract levels. (Our greatest problems with the neighborhoods stem from their size, not the data.) For the purpose of feasibility testing, we are using selected characteristics to describe the neighborhoods and compare them with what we know, can infer, or can readily

guess about CBD employees. The characteristics used in this section are occupation, income, age, and house value and rent level. Additionally, data on access (time/distance to the CBD) has been obtained from A/C Transit.

In future portions of the study, we can further refine our neighborhood or tract descriptions by using special Census 4th count data series on earnings by occupation, industry of employed, former place of residence, year moved into unit, household characteristics, and perhaps others as well. If necessary, we could go to other sources to get data on community facilities, such as park space per dwelling unit, library space, etc. In general, then, the data availability for place of residence is excellent.

Unfortunately, data availability on CBD or high-rise office employment is extremely limited. In fact, there is no statistical documentation readily available to prove that employment in the CBD is growing in absolute levels. In order to perform our cross-sectional analysis with the neighborhoods, we should have an understanding of occupational mix, income distribution by occupation, age, sex, etc. of CBD and high-rise office employees. Since no such data is available, we have made do with a 1965 BATSC tabulation of employment by tract and estimated 1970 industrial and occupational levels for the purposes of testing the methodology. As demonstrated previously, there are significant differences between the BATSC material and Census material, but since our interest is primarily in occupational distribution, we feel that the data produces adequate results for correlating CBD employment to neighborhood occupational characteristics. If possible, a more recent data source will be located for the next phase of this study. Possibly we will be able to sort HRD material by zip code or make adjustments to the EEOC data to include government and other non-covered employment.

It is useful at this point to recognize a distinction between CBD employees overall and office workers. The CBD employment base includes large numbers of sales, service, and other non-office-type occupational workers. Since the purpose of the entire effort is to deal with the impact of high-rise structures and since office buildings are the most typical form of high-rise structures in the CBD, it is useful to focus our attention on their employment composition.

As we have been unable to uncover any existing data on high-rise office workers that appears adequate, we made some assumptions regarding income and age in order to test our ability to make predictions. In the next phase of the study, we propose to undertake a direct survey. One way in which this could be done is to gain the cooperation of several very large firms and obtain permission to perform a statistical analysis of their employment records. In such a survey, we would extract information on place of residence, age, sex, family status, occupation, how long the person has been employed, etc. From the data we could refine our commutation patterns by occupation/age/sex, learn at what stage of life (young, single, etc.) people tend to be hired, come to the city, or move to the suburbs, and if new employees tend to show different traits than those employed ten years ago. In general, we could vastly improve the state of the art as far as data on office/high-rise employment is concerned and, in so doing, certainly improve our ability to predict residential choice and its implications.

(e) Statistical Presentation

As a method of presenting comparisons between San Francisco neighborhoods and CBD employment, the technique of using indices of residential specialization used by Hoover and Vernon in Anatomy of a Metropolis (1962) is adopted. The indices are produced by comparing a percentage spread in one neighborhood to a percentage spread for the CBD. In those cases where data for the CBD is either lacking or meaningless, a city-wide average is used. (An illustration of how the indices are developed is contained in the next section on the "CBD as place of work" initial tabulation.) The advantage of using indices over a straight ranking technique is that insignificant differences in percentage spread show up as insignificant differences in index number. The indices developed for individual neighborhood characteristics may be analyzed to indicate where demand for housing units is and will be and, ultimately, what can be the impact of that demand on the housing market in the individual neighborhoods.

(2) Commutation to the CBD

The 1970 Census data series on place of work for San Francisco Census tracts have been tabulated into neighborhood summaries. As the following table indicates,

TABLE D-4

PLACE OF WORK
SAN FRANCISCO NEIGHBORHOODS
(1970)

		Work in CBD		% Total Employed		
				Who Work in CBD	Who Work Elsewhere in S.F.	Who Work Outside S.F.
1.	Richmond	9,456	11.4%	27.5%	55.8%	16.7%
2.	Marina	7,674	9.3%	32.7%	47.3%	20.0%
3.	Northeast	12,309	14.9%	34.6%	48.5%	16.9%
4.	Downtown	6,578	8.0%	42.1%	35.9%	22.0%
5.	Western Addition	5,082	6.1%	25.3%	54.9%	19.8%
6.	Buena Vista	3,413	4.0%	21.7%	52.3%	26.0%
7.	Central	6,245	7.6%	24.5%	53.1%	22.4%
8.	Mission	4,364	5.3%	23.1%	57.0%	19.9%
9.	South of Market	1,242	1.5%	12.6%	77.0%	10.4%
10.	South Bayshore	1,475	1.8%	14.4%	50.5%	35.1%
11.	Bernal Heights	2,003	2.4%	22.3%	58.2%	19.5%
12.	South Central	4,502	5.4%	17.5%	60.7%	21.8%
13.	Ingleside	4,748	5.7%	20.8%	57.8%	21.3%
14.	Inner Sunset	4,680	5.7%	26.0%	55.6%	18.4%
15.	Outer Sunset	7,403	8.9%	27.0%	53.9%	19.1%
	Total	81,174*	100.0%	26.0%	61.9%	12.9%

* Does not include "Place of Work Not Reported" or data for the Presidio (which is not included in any of the City Planning Department's neighborhoods).

Sources: U.S. Census
Keyser/Marston & Associates

there are some significant variations in place of work distribution among various neighborhoods. Shares of the total number of employed residents who work in the CBD range from a high of 42% in the Downtown neighborhood to as low as 12.6% in the adjacent South of Market neighborhood. The distribution of San Francisco residents employed in counties outside San Francisco provides some interesting insights, too, since based on what we learned in the previous section, we would expect them to be largely blue collar workers and will look for evidence to bear that out in the subsequent discussions.

As a statistical means of comparing the relative differences between neighborhoods, the percentage working in the CBD is compared to the city-wide average. For example, the average CBD commutation level for the Richmond district is slightly higher than that for the city and therefore produces an index of higher than 1.00 (27.5 - 26.0 = 1.04). Neighborhoods with below the city average of CBD commutation, by contrast, produce indices of less than 1.00. Presented in ranked order, then, the indices of residential specialization for CBD commuters are:

Neighborhood	Index
Downtown	1.62
Northeast	1.31
Marina	1.24
Richmond	1.04
Outer Sunset	1.01
Inner Sunset	0.98
Western Addition	0.95
Central	0.92
Mission	0.87
Bernal Heights	0.83
Buena Vista	0.82
Ingleside	0.78
South Central	0.66
South Bayshore	0.54
South of Market	0.47

In the subsequent paragraphs we will expect to find a range of characteristics to explain why the index spread produces the above results.

(3) Access to the CBD

It is generally agreed and well-documented that access to place of work is a foremost determinant of residential choice. This premise holds that, all other factors being equal (which they never are), persons desire to

live in close proximity to place of work. The larger the geographical area under study, the more clear the relationship appears; and, conversely, the smaller the area, the more other factors tend to obscure the importance of access.

As a data source for access in San Francisco, we obtained the time on public transit "skim tree" between traffic zones in the city. The 161 traffic zones were aggregated into the 15 neighborhoods and average time to the center of the CBD was calculated. Appendix Table D-3 contains the zone tabulation and totals. Average commuting times by neighborhood are shown below with conversion to the index ranking.

Neighborhood	Average Time	Index
Downtown	11.2 min.	2.49
Northeast	13.2 min.	2.11
Western Addition	18.5 min.	1.51
Marina	20.0 min.	1.40
South of Market	21.9 min.	1.27
Richmond	27.9 min.	1.00
Buena Vista	28.2 min.	.99
Mission	28.8 min.	.97
South Bayshore	31.8 min.	.88
South Central	33.7 min.	.83
Central	35.0 min.	.83
Bernal Heights	37.8 min.	.74
Inner Sunset	39.4 min.	.71
Ingleside	39.8 min.	.70
Outer Sunset	47.1 min.	.59

Clearly, in San Francisco access does not fully explain the ranking of percentage employed in the CBD. It does much to explain the high rankings of the Downtown, Northeast, and Marina neighborhoods, but explains little about South Bayshore, which has a high access to CBD ranking but the largest percent of out-commuting to other counties for work. It is evident, then, that other factors must be strong determinants of residential choice. for some people - like Blacks who live in South Bayshore

(4) Occupations of Central Business District Employees

As discussed in the introduction to this chapter, we should have a full range of data on CBD employment against which to correlate San Francisco neighborhood characteristics. Underlying our desire to make these correlations is the well-researched premise that persons prefer to live where their neighbors will be like themselves. Of the many characteristics for which like seeks like, occupation usually is the most powerful (outside of race). White collar workers generally do not seek residence in blue collar neighborhoods regardless of income or other similarities.

Given the importance of occupational distribution of CBD workers, we took data on CBD employment by industry and converted it to occupational composition against which to compare neighborhood occupational distribution. The only data source available was a 1965 tabulation of employment by two digit SIC code by Census tract prepared by BATSC. BATSC obtained data from HRD on employment covered by unemployment insurance, distributed it to the tract level, and adjusted it to reflect some independent surveying for uncovered employment. Appendix Table D-4, which presents the 1965 data by tract, shows that when summarized the data produces a total CBD employment of 160,000, or only 5,000 less than the 1970 CBD employment level established by the Census. This discrepancy is to be expected based on our previous review of BATSC data compared to Census materials. Since we are interested in employment by industry only as a means of deriving an occupational spread to test methodology, the absolute level need not bother us.

To convert the employment by industry to employment by occupation, it was necessary to develop an industry-occupation matrix, since no appropriate matrices were available at the time our test was performed. To prepare our matrix, we used the U.S. Department of Labor's national matrix where it was considered valid--that is, for the retail categories, most of the service categories, and finance/insurance/real estate categories. For manufacturing, wholesaling, transportation and government categories, we made judgments for individual categories depending on location and our knowledge of specific large firms. When a very large number of employees in certain

manufacturing categories appeared, we applied an occupational spread describing office workers in a New York City (which was contained in the book, The Office Industry, Patterns of Growth and Location, a report of the New York Regional Plan Association). For example, when a large number of persons appeared in the South of Market tract in railroad employment, we concluded that they were the Southern Pacific and other office workers rather than conductors, brakemen, etc.

The application of our matrix to the BATSC CBD employment by industry is contained in Appendix Table D-5. When applying the matrix, we updated the 1965 employment by industry figures by reducing some categories of manufacturing and wholesaling employment which are known to have been heavily declining industries in San Francisco over the period. To increase other employment to 1970 levels, we summarized the square footage of new office space constructed in major buildings between 1965 and 1970 (Appendix Table D-6) and converted it to new office employment at 200 sq. ft. per employee. To the new employees, we applied the occupational mix of office buildings in the New York Region, assuming it would be sufficiently representative of the occupational spread in San Francisco office building to be useful for our purposes.

The results of the conversion (Appendix Table D-7) produced an estimated 1970 occupational composition of the San Francisco CBD (Census definition) as follows:

	Number	Distribution
Professional & Technical		
Health	703	.4%
Educational	254	.1%
Others	18,505	10.8%
Subtotal	19,462	11.3%
Managers, etc.	27,031	15.8%
Clerical	67,747	36.3%
Sales	20,017	11.7%
Other	42,646	24.4%
TOTAL	170,426	100.0%

TABLE D-5

OCCUPATIONAL DISTRIBUTION RANKING
SAN FRANCISCO NEIGHBORHOODS
(1970)

		Professional Total	Professional Total Ex. Health & Educ.	Managerial	Sales	Clerical	Total Ex. Health & Educ.
1.	Richmond	1.75	1.11	0.57	0.73	0.84	3.25
2.	Marina	2.32	1.66	.83	.90	.86	4.25
3.	Northeast	1.52	1.20	.62	.67	.76	3.25
4.	Downtown	.97	.85	.51	.56	.92	2.84
5.	Western Addition	1.43	.96	.39	.50	.79	2.64
6.	Buena Vista	1.79	1.28	.38	.40	.79	2.85
7.	Central	1.81	1.18	.49	.53	.80	3.00
8.	Mission	.68	.51	.24	.33	.83	1.91
9.	South of Market	1.20	.90	.34	.30	.72	2.26
10.	South Bayshore	.49	.34	.16	.27	.67	1.44
11.	Bernal Heights	.80	.57	.25	.41	.70	1.93
12.	South Central	.72	.46	.35	.50	.77	2.08
13.	Ingleside	1.63	1.07	.60	.75	.75	3.17
14.	Inner Sunset	2.41	1.44	.59	.69	.79	3.51
15.	Outer Sunset	1.43	.97	.58	.81	.84	3.20

Source: U.S. Census
Keyser/Marston & Associates

The key occupational characteristic of CBD employment is the high concentration of professionals, managers, clerical workers, and sales personnel. Health and educational professionals are separately treated since their importance in the CBD is minimal and since it is possible to isolate them from total professionals in the published Census materials on place of residence. As to be expected, the occupational composition of office building studies in New York showed even higher concentrations of professional, managerial, and clerical personnel.

After completion of our analysis, an industry-occupation matrix developed for San Francisco from EEOC data by another member of the study team became available. When compared to the matrix we developed, we concluded that while some differences existed, the matrix would produce essentially the same occupational spread for total CBD employment.

(5) Occupation of Employed Residents

The tabulation of Census data for neighborhoods on occupational mix begins to produce results more in keeping with the percent employed in the CBD ranking. The indices generated by the calculations contained in the appendix (Tables D-8 and D-9) are presented on the page opposite. Individual occupations are shown because there are some telling variations among the neighborhoods by occupation. Additionally, the separation of health and educational professionals from total professionals produces some interesting results in some neighborhoods, but in general illustrates that professionals tend to prefer the same neighborhood regardless of their type.

Ranked in order of residential specialization index, we begin to see a new order appearing.

Neighborhood	Index
Marina	4.25
Inner Sunset	3.51
Northeast	3.25
Richmond	3.25
Outer Sunset	3.20
Ingleside	3.17
Central	3.00
Buena Vista	2.85
Downtown	2.84
Western Addition	2.64
South of Market	2.26
South Central	2.08
Bernal Heights	1.93
Mission	1.91
South Bayshore	1.44

The Marina neighborhood, which contains Pacific Heights as well, begins to emerge as a clear leader as a place of residence for those in CBD type occupations, particularly the professional and managerial group. The Inner Sunset also emerges as a neighborhood of professional employees. The next four neighborhoods in the ranking are so close together that their difference in occupational spread is relatively insignificant. From the Central neighborhood on down the list, the differences become more pronounced and therefore more meaningful.

With more detailed Census data on occupation, we will be able to considerably refine CBD type occupational rankings. For example, we will be able to separate store managers from office managers, secretaries from postal clerks, both of which are clerical workers, and so on. With better data, CBD office worker neighborhoods will emerge more clearly and those which less belong will begin to disappear.

TABLE D-6

INCOME/HOUSE VALUE/RENT LEVEL
SAN FRANCISCO NEIGHBORHOODS INDEXED RANKING
1970

Income Over $25,000*	House Value Over $35,000	Percent Rent Level Over $200/mo.
Marina (2.67)	Marina (3.67)	Marina (2.77)
Inner Sunset (1.68)	Northeast (2.84)	Ingleside (2.36)
Ingleside (1.60)	Western Addition (2.19)**	Outer Sunset (1.59)
Northeast (1.43)	Inner Sunset (1.88)	Northeast (1.35)
Richmond (1.43)	Richmond (1.75)	Inner Sunset (1.25)
Outer Sunset (.81)	Buena Vista (1.60)	Richmond (1.20)
Central (.69)	Ingleside (1.35)	Central (1.09)
Buena Vista (.56)	Central (0.91)	Western Addition (0.67)
Western Addition (.51)	Mission (0.52)	Buena Vista (0.54)
South Central (.46)	Outer Sunset (0.48)	South Central (0.42)
Bernal Heights (.40)	South of Market (0.39)	Bernal Heights (0.22)
South of Market (.33)	Downtown (D)***	South of Market (0.17)
South Bayshore (.32)	South Bayshore (0.26)	Downtown (0.16)
Downtown (.24)	Bernal Heights (0.18)	Mission (0.10)
Mission (.18)	South Central (0.10)	South Bayshore (0.07)

*Income of families and unrelated individuals

**The absolute number of units existing over the indicated test values is so small that the ranking is of dubious validity.

***Indicates data not published in the Census for disclosure reasons.

Sources: U.S. Census
Keyser/Marston & Associates

(6) House Value/Rent Level/Income

House value, rent level, and income characteristics for San Francisco neighborhoods are treated together in this analysis since they are so highly interrelated and function as a result of one another. Due to the importance of income in residential choice and the fact that we are without data on income levels for CBD workers, and more particularly high-rise office employees, we must make some assumptions regarding income in order to demonstrate that we can predict where CBD workers will want to live based on income characteristics. The assumption we make is that CBD workers, particularly high-rise workers, represent a larger share of the upper-income families and unrelated individuals than other workers. Because of their incomes, a larger share of CBD or high-rise office workers can and do afford the highest rents and most valuable homes. The high test levels of income over $25,000 per year, rents over $200 per month, and homes valued over $35,000 have been selected for presentation since it was found that lower levels tended to obscure the results on the large scale neighborhood basis, as can be seen from the summary tabulations contained in the appendix (Appendix Tables D-10, 11, 12, 13, and 14).

Indexed rankings for both owned and rented housing are presented since the relative frequency of these two housing types changes sharply from neighborhood to neighborhood (See Appendix Table D-12). Additionally, it is important to point out that the published Census material on house values includes only owner-occupied single-family homes; thus, values of owner-occupied duplexes, etc. are excluded.

The neighborhoods shown opposite begin to repeat the pattern identified in the occupational distribution ranking. The Marina again emerges as the clear leader with the Inner Sunset, Ingleside, Northeast and Richmond neighborhoods bunched together and somewhat behind. Consistency of a middle group composed of the Outer Sunset, Central, and Buena Vista also begins to appear. The unexpectedly high ranking of the Western Addition is probably explained by the neighborhood definition--namely, the inclusion of some upper income tracts. The repeated ranking of the Downtown at the low end of the spectrum begins to tell us that while the neighborhood has the highest incidence of CBD employees, few of them are well paid ones, and, as the occupation distribution tells us, few are professional or managerial employees.

If the proposed survey of high-rise workers is conducted, we will be able to extract income levels for different occupations and then make comparisons to city-wide averages in the same occupations and for all occupations. The city-wide averages will be obtained from the special Census tape data series on earnings by occupation. We will then be able to better relate income, rent levels, and house value to the individual residential areas.

(7) Age

We know very little about age, sex, or family status of CBD workers in general or high-rise office workers in particular, and there seems to be virtually no published data on the subject. We can guess from the high incidence of clerical workers, which are predominantly women, that there will be fewer children per high-rise office employee than per employee elsewhere, and, thus, we can examine the neighborhoods for age distribution.

As a test, then, we have tabulated the population between ages 20 and 64 (Appendix Table D-15 and D-16) and ranked the percentages with the following index results:

Population Between Ages 20 and 64

Neighborhood	Index
Marina	1.14
Downtown	1.11
Buena Vista	1.08
Northeast	1.07
Central	1.06
Western Addition	1.03
Inner Sunset	1.00
South of Market	.99
Richmond	.99
Outer Sunset	.97
Ingleside	.94
Mission	.93
Bernal Heights	.91
South Central	.91
South Bayshore	.84

The ranking produces some seemingly peculiar results based on the rankings we have seen previously, but the results are obviously in part explained by the fact that we have not accounted for CBD employees who do have

TABLE D-7

SUMMARY OF INDEXED RANKINGS OF RESIDENTIAL SPECIALIZATION
SAN FRANCISCO NEIGHBORHOODS
1970

Rank	Percent Total Employed Who Work in CBD		Access Transit Time To The CBD		Concentration of CBD Type Occupations		Income Over $25,000*		Working Age Concentration 20 - 64 Years	
1.	Downtown	1.62	Downtown	2.49	Marina	4.25	Marina	2.67	Marina	1.14
2.	Northeast	1.31	Northeast	2.11	Inner Sunset	3.51	Inner Sunset	1.68	Downtown	1.11
3.	Marina	1.24	Western Addition	1.51	Northeast	3.25	Ingleside	1.60	Buena Vista	1.08
4.	Richmond	1.04	Marina	1.40	Richmond	3.25	Northeast	1.43	Northeast	1.07
5.	Outer Sunset	1.01	South of Market	1.27	Outer Sunset	3.20	Richmond	1.43	Central	1.06
6.	Inner Sunset	.98	Richmond	1.00	Ingleside	3.17	Outer Sunset	.81	Western Addition	1.03
7.	Western Addition	.95	Buena Vista	.99	Central	3.00	Central	.69	Inner Sunset	1.00
8.	Central	.92	Mission	.97	Buena Vista	2.85	Buena Vista	.56	South of Market	.99
9.	Mission	.87	South Bayshore	.88	Downtown	2.84	Western Addition	.51	Richmond	.99
10.	Bernal Heights	.83	South Central	.83	Western Addition	2.64	South Central	.46	Outer Sunset	.97
11.	Buena Vista	.82	Central	.80	South of Market	2.26	Bernal Heights	.40	Ingleside	.94
12.	Ingleside	.78	Buernal Heights	.74	South Central	2.08	South Bayshore	.32	Mission	.93
13.	South Central	.66	Inner Sunset	.71	Bernal Heights	1.93	South of Market	.31	Bernal Heights	.91
14.	South Bayshore	.54	Ingleside	.70	Mission	1.91	Downtown	.24	South Central	.91
15.	South of Market	.47	Outer Sunset	.59	South Bayshore	1.44	Mission	.18	South Bayshore	.84

Source: U.S. Census
Keyser/Marston & Associates

children. When matched with the occupation rankings, we can begin to see that CBD workers without children tend to have a strong preference for the Marina, Downtown, and Northeast neighborhoods, while families with children tend to show preference for the Inner Sunset, Richmond and Ingleside neighborhoods. The Buena Vista and Central neighborhoods have moved up the ranking from middle ground, perhaps telling us that an important portion of CBD or high-rise office workers without children may be living in these neighborhoods.

Again, with the proposed survey, we will no longer need to guess and will be able to make some detailed correlations of age, sex, and family status of high-rise office workers with neighborhood characteristics and thus be better able to predict residential choice.

(8) Summary

From the four determinants of residential choise tested against CBD commutation levels, we are able to see that relationships can be reliably established. Even with the weakness of analysis at the neighborhood level and less than fully detailed data, we can see some predictable residential patterns for existing and future employees of the CBD, particularly high-rise office employees. For example, if we look at the summarized rankings, we can see that on the average the Richmond is a preferred area for a person employed in an office type occupation who has a fairly high family income, but not one high enough to live in the Marina, nor even the Inner Sunset. The downtown neighborhood is an acceptable residential location for lower income CBD clerical or sales workers, but not at all acceptable for upper-income persons with or without children.

To those of us familiar with San Francisco, these findings at the upper third of the neighborhood rankings are of little surprise. Nor are we surprised that South Bayshore, South of Market and South Central are not preferred neighborhoods for CBD office type employees. Where we begin to learn more is with the middle ranking CBD commuting neighborhoods, or those which have some above average concentrations of professional workers, fair access to the CBD, and high incidence of working age population--for example, the Central neighborhood.

With more accurate data on CBD employment which we will obtain from our proposed survey, and more detailed data on the demographic and employee characteristics of residential areas, we should be able to fairly accurately predict where the new CBD high-rise office employees will want to live. We will be able to say which residential areas will be prefered in what order given one's occupation, income, age, and family status. Working at the Census tract level, or with small aggregations of tracts, we should be able to locate more precisely where demand for housing generated by new CBD high-rise office buildings will occur.

Once we are able to quantify demand under alternative future CBD high-rise growth policies, we will be able to say what policies and conditions will determine what resulting impacts on residential areas will occur. For example, whether or not the demand for housing in a certain area will be satisfied, in that area, will be a function not only of the magnitude of demand and its effect on price movements, but also on policy decisions related to zoning which may determine the ability of the area to build new housing. If restrictive growth policies are imposed on an area, we will be able to say what the resulting impacts will be in terms of increased demand in other areas slightly lower in the preference ranking.

In summary, however, we should be able to predict with good confidence the demand locations and levels in San Francisco residential areas generated by new high-rise office construction in the CBD and the resulting impact under alternative policy conditions.

3. House Values, Rents, & New Residential Construction

This section deals with the impact of residential decisions of high-rise office workers on housing costs and new construction in San Francisco neighborhoods. Our basic hypothesis is that in any neighborhood, additional demand for housing that stems from new employment in the downtown will result in one or several of the following effects: (1) increased house prices, (2) increased rents, and (3) increased residential construction.

As discussed in the introduction to this chapter, the quantification of the impact of high-rise employment on these three variables is difficult both because of the powerful influence of many other forces on the housing market and because of the existence of complex interrelationships among the variables themselves. Among the highly significant other forces on the supply side, we might list zoning, construction costs, construction financing, erosion of existing stocks from deterioration and competition from other land uses, tax policies, limitations on land availability, and discrimination. On the demand side a minimum list would include changes in household income, household size, access to regional housing, racial tension, income tax regulations, quality of local schools, and changes in consumer tastes with respect to housing style, quality, space, and environmental amenities.

Of equal concern for our study are the interrelationships among the key variables themselves. A change in any one of the variables should evoke a market response that will in turn affect the other two. An increase in house values, for example, may increase the relative demand for space in multi-family units, moderating house value increases while raising rental rates. An increase in rental rates in turn may spark new multi-family construction, moderating rental increases but decreasing the desirability of the neighborhood for single-family residents. In the latter case, the net effect on house values might not be clear in the price indexes available to us, for a decline in the value of the structure itself might be more than offset by an increase in the value of the land on which it stood. In general, after all these indirect effects have had time to occur, we would expect all the variables to move in the same direction. Where local circumstances have blocked expected movement in one of the three, additional compensating movement in one or both of the other two is to be suspected.

Because of these complex interrelationships, we do not expect that our key independent variable, demand changes due to employment, will totally explain the variation we will observe between neighborhoods in housing market activity. Our aim is to determine

how much of the variation we can explain with a limited set of variables in order to determine the feasibility of including this scale of neighborhood impacts in our overall evaluation of the effects of high-rises on San Francisco.

a. Area Boundaries

In order to assure maximum comparability between the results of this section and those of the preceding section, we used the same set of neighborhood definitions based on Census tracts that have been established by the Department of City Planning. (These are shown in the map opposite page 178.) In compiling data on this basis, we encountered a set of problems similar to those cited in the foregoing section. Differences between neighborhoods in terms of each of our characteristics were generally statistically significant, yet in-depth examination of each neighborhood revealed considerable variation within neighborhoods that seemed too pronounced to ignore. This suggests that future research of this nature on a city-wide scale should follow one of two courses: (1) use of a random sample of smaller area units such as Census tracts, of (2) definition of new neighborhood boundaries to produce neighborhoods that were relatively homogeneous in terms of some of the key characteristics that we are examining. While these changes would improve our results, we concluded on the basis of several trial redefinitions, that they would not significantly change our basic conclusions with respect to the feasibility of our analytic methods, and we proceeded on that basis.

b. Data Sources

(1) House Values

We explored several sources of data on house prices. The San Francisco Multiple Listing Service and the San Frencisco Real Estate Board both maintain information on on a large portion (perhaps 60%) of all single-family homes sold in the city and both organizations generously afforded access to their files. Trial samples of these records revealed several problems. To obtain a geographically comprehensive sample, it would be necessary to sample both sets of records, and in a portion of the records, sales listings and final selling prices were maintained at physically separate locations. Additionally, sales were filed by street address within the city, making the development of a street address-geographic neighborhood code mandatory and, for a large sample, computer coding of the data base extremely desirable.

TABLE D-8

HOUSING PRICE CHANGES
SAN FRANCISCO
1960-1970

Area		Median Value 1960	Median Value 1970	Average Annual % Increase	Median Rent 1960	Median Rent 1970	Average Annual % Increase
1.	Richmond	19,400	32,900	5.4	92	160	5.7
2.	Marina	25,000+	50,000+	7.1	97	173	6.0
3.	Northeast	25,000+	50,000+	7.1	69	134	6.9
4.	Downtown	25,000	30,000	1.2	59	97	6.1
5.	Western Addition	19,500	35,200	6.1	66	123	6.4
6.	Buena Vista	17,200	31,200	6.1	71	130	6.2
7.	Central	14,300	25,500	5.9	79	152	6.8
8.	Mission	14,600	23,200	4.7	66	114	5.6
9.	South of Market	13,200	22,000	5.2	48	92	6.7
10.	South Bayshore	14,700	23,200	4.7	56	85	4.3
11.	Bernal Heights	12,600	21,100	5.3	72	126	5.8
12.	South Central	14,800	23,900	4.9	81	145	6.0
13.	Ingleside	18,200	29,200	4.8	120	179	4.1
14.	Inner Sunset	21,400	33,800	4.7	94	161	5.5
15.	Outer Sunset	18,400	28,400	4.4	111	171	4.4
	San Francisco	17,300	28,100	5.0	73	135	6.3
	SMSA	16,300	26,900	6.5	78	140	8.0

Source: U.S. Census
Keyser/Marston

The assessor's office also maintains sales data indexed by assessor's block, year of sale, age of building, and type of structure (single-family, flats, and apartments). The volumes that we examined appeared to contain on the order of 20,000 sales, making statistical sampling both necessary and appropriate. A 5% sample, probably the minimum acceptable, would involve on that basis about 1,000 entries. Since the data was to cover 14 neighborhoods, we considered a sample on the order of 2,000 much more desirable. However, the well-organized data on recent sales was not comparable with pre-1967 assessor's records, and by this time it had become apparent that data going back to 1960 was needed for a good comparison with employment changes.

In the end, we settled on U.S. Census data which resulted in the neighborhood-specific housing price changes shown in Table D-8. These are based upon owner estimates of value of owner-occupied, single-family dwellings tabulated by Census tract and aggregated by us to the neighborhoods listed. The values shown are median values, not means, so that one half of the houses in each neighborhood cost more than the amount shown and one half cost less. In the neighborhoods where the value figure ends with a plus sign, the median value is higher than the maximum closed end value bracket used in the Census. These neighborhoods contain a very small proportion of single-family housing and constitute an even smaller portion of the total housing stock of the city, so that the discrepancy is not serious. Other analysts have suggested that there is a systematic tendency of under-reporting of value in the Census. The 1960 Census figures, however, are reasonably close to those reported in an independent study based on sales data conducted by Leonard P. Vidgar (1969). Even if under-reporting does occur, it is reasonable to assume that it operated similarly in both Census years and that the trends in value changes are of acceptable accuracy.

(2) Rents

Neighborhood specific rental information was much more difficult to obtain than house value data. We discovered no usable compilations other than the Census, and that is the source of the figures shown in Table D-8. Again the rent levels are medians, rather than means. In interpreting these figures it must be born in mind that they are more affected than house values by demolition and new construction. In rental housing, demolished units

TABLE D-9

CONSTRUCTION ACTIVITY
UNITS COMPLETED - SAN FRANCISCO NEIGHBORHOODS
1960 - 1971

	1960-67	1968	1969	1970	1971	Sub Total	Adjustment For Non-Market Units*	Total	Annual Average
1. Richmond	3,099	113	140	164	180	3,686	-	3,686	307
2. Marina	1,710	64	66	360	46	2,246	-	2,246	187
3. Northeast	3,554	486	126	100	61	4,327	-	4,327	393
4. Downtown	878	-	-	-	97	975	276	699	64
5. Western Addition	2,152	92	522	91	485	3,342	1,223	2,119	193
6. Buena Vista	941	26	21	-	60	1,048	-	1,048	87
7. Central	3,312	351	238	89	289	4,279	379	3,900	355
8. Mission	968	3	147	3	5	1,126	-	1,126	94
9. South of Market	299	3	1	2	-	305	-	305	25
10. South Bayshore	765	7	3	10	9	794	231	794	72
11. Bernal Heights	521	5	1	15	21	563	-	563	47
12. South Central	2,315	39	30	66	54	2,504	-	2,504	209
13. Ingleside	1,073	20	14	11	27	1,145	-	1,145	95
14. Inner Sunset	1,930	178	36	65	51	2,260	-	2,260	188
15. Outer Sunset	926	19	20	14	112	1,091	-	1,091	91
Total City	24,433	1,406	1,365	990	1,497	29,691	1,878	27,813	2,528

* Non-Market units are subsidized units in Redevelopment Areas

Source: City of San Francisco Planning Department
San Francisco Redevelopment Agency
Keyser/Marston & Associates

tend to be at the lower end of the housing price range and new units tend to be at the upper end. As this occurs, the median value of all rental units may tend to increase the average rent level of all units more rapidly than the rent level of existing units that undergo no physical change. The observed median price of all units is still a good guide to the housing cost faced by a person changing his dwelling place.

(3) Construction Rates

Our figures on residential construction activity by neighborhood, shown in Table D-9, are taken from the report series issued by the Department of City Planning under the title "Changes in the San Francisco Housing Inventory." Only two adjustments to those figures were necessary. Estimated subsidized housing in redevelopment areas was deleted since we were interested in market response to changed market conditions. Also, pre-1968 neighborhood totals were re-aggregated to reflect the new boundaries established at that time.

(4) Employment

Developing data on changes in employment attributable to high-rise development presented a series of intractable problems, some of which were discussed in Section 2 of this chapter above. The time series approach adopted in this section precluded the use of the static solutions adopted there. After a series of experiments, we adopted a series of indices that, interpreted with care, can yield some insight into the issue we are studying. The ones used were:

(a) Changes in employed residents in "office type" occupations defined to include the professional, managerial, and clerical occupational categories.

(b) Changes in employed residents in professional and managerial categories alone.

(c) Changes in employed residents in the clerical category alone.

(d) Percent of employed residents with work place in the CBD (as discussed in Section 2, page 181).

Data on the first three indices is presented in Table D-9. 10
Within the "office-type" occupational category, the distinction between, on the one hand, professional and managerial employees and, on the other hand, clerical

TABLE D-10

PERCENTAGE INCREASES IN OFFICE-TYPE EMPLOYMENT
SAN FRANCISCO 1960 - 1970

		All Office-Type	Professional & Management	Clerical
1.	Richmond	17.6%	16.4%	18.6%
2.	Marina	4.5	7.2	1.2
3.	Northeast	17.0	18.5	15.6
4.	Downtown	6.7	4.3	7.6
5.	Western Addition	18.8	14.6	22.4
6.	Buena Vista	19.2	36.1	6.9
7.	Central	60.8	92.5	38.9
8.	Mission	27.2	19.4	31.2
9.	South of Market	45.9	56.4	38.5
10.	South Bayshore	24.6	3.0	37.6
11.	Bernal Heights	53.5	37.0	63.1
12.	South Central	26.0	29.6	24.3
13.	Ingleside	2.2	- 4.5	10.1
14.	Inner Sunset	16.0	14.4	18.3
15.	Outer Sunset	6.4	7.5	5.6
	San Francisco	16.9	17.5	16.2

Source: U.S. Census

employees was made on the assumption that income differences between the two categories separate them into two housing sub-markets. The first, higher-income category, would be related to the demand for both single-family housing and rental units. The second would be primarily related, within San Francisco, to the rental market. This assumption will be cross-checked in Step 3 against a special tabulation of income by occupation of San Francisco residents available from the 1970 Census Public Use Tapes.

(5) Access

The access data is the same as that discussed in Section 2, page 182. It is used here because we know that access is one of the most powerful determinants of residential choice and, in San Francisco, will change in fairly predictable ways during the future period we will be considering in Steps 2, 3, and 4. The inclusion of this variable in the analysis will provide us with a means of partially adjusting our neighborhood specific estimates to the new situation that will prevail once BART and the MUNI subway are in operation. (A more comprehensive evaluation of the effect of access changes may be available as the BART corridor impact studies currently being conducted by BART, coordinated with MTC, are completed.)

c. Residential Mobility

As this analysis is extended in Step 3, residential mobility will be evaluated for its relationship with high-rise employment. Two approaches will be used. First, we have confirmed that length of residence and place of previous residence data are availalbe from both the 1960 and 1970 Census. This data will be analyzed, using the methods to be discussed below, in order to determine if there is any systematic correlation between changes in high-rise employment in the neighborhoods and changes in the rate of neighborhood turnover. If such a relationship were discovered, it could be the result of a higher rate of mobility among high-rise employees or reflect the displacement of existing residents by new high-rise employees seeking housing in the neighborhood. The analysis can be done both cross-sectionally for 1970 and on a time change basis between 1960 and 1970 using the employment change estimating techniques discussed above. If a significant relationship can be discovered, the finding will have important implications for the relationship between downtown high-rise commercial construction and local neighborhood social stability.

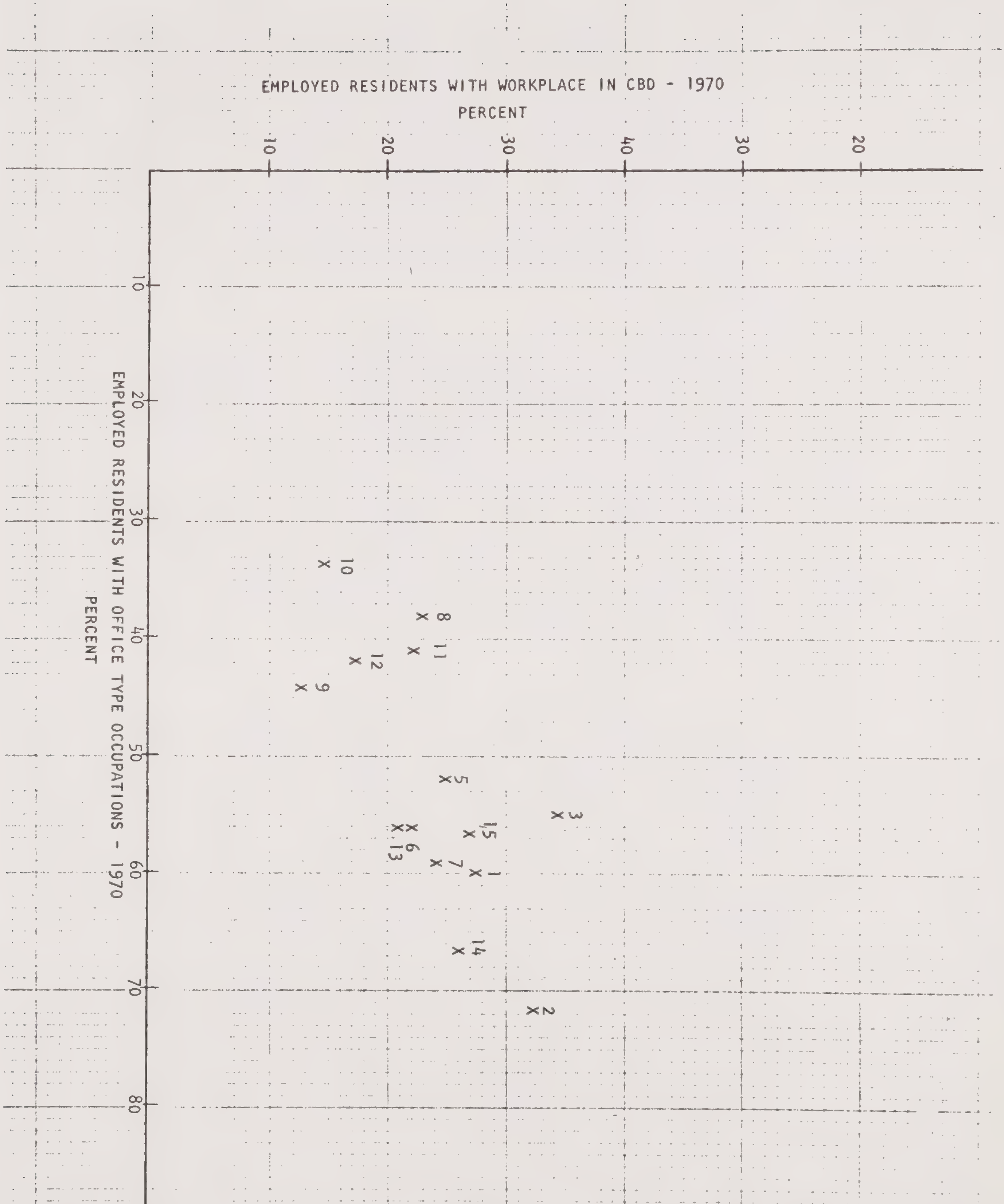

EMPLOYED RESIDENTS WITH WORKPLACE IN CBD - 1970
PERCENT
10
20
30
40
30
20
EMPLOYED RESIDENTS WITH OFFICE TYPE OCCUPATIONS - 1970
PERCENT
10
20
30
40
50
60
70
80
10
8
11
12
9
5
3
15
6
13
7
1
14
2

FIGURE 1

d. Methods

We have adopted a two-stage approach to the analysis of the variables described above. In the first stage we do a series of graphs on which the neighborhoods are plotted one at a time in terms of two variables. For example, one graph will show the relationship between changes in rent levels and changes in clerical employment for all of the neighborhoods in the city being examined. As usual in this type of analysis, the extent to which the plotted points tend to fall in a line is a measure of the degree of association between the variables plotted. In the second stage we use mathematical measures of correlation.

This exploratory step was adopted for several reasons. The visual plots will reveal very quickly whether there appears to be sufficient association between the variables to warrant investment in more costly and time-consuming computer analysis of the data. Also, repeated plots of the same variables expressed in different form will suggest which form of expression is likely to yield the most consistent results. Changes in rents, for example, could be expressed in both real numbers and in percentages; and there are theoretical arguments to support both procedures. Moreover, plotting by neighborhood allows for quick identification of those neighborhoods that deviate from the expected relationships. These deviations can be evaluated in terms of other information that is available on the deviating neighborhoods to determine if the deviations are random or if they reflect the systematic influence of another variable that is so powerful that it must be included in the analysis.

The graph on the opposite page is presented as a demonstration of the plotting technique and also serves as a cross-check on the assumption made at several points in this study regarding the relationship between CBD employment and "office type" employment. The "x"'s show the values plotted. (The numbers are keyed to the neighborhoods shown in Table D-10.) The variables plotted are: (1) percent of employed residents in each neighborhood with work place in the CBD versus (2) percent of employed residents in the same neighborhoods whose occupational category is professional, managerial, or clerical. The plotted points show that there is a strong relationship between the two variables, but somewhat less than might be expected. A 40% value for office type employment implies a 20% value for CBD employment. A 60% value for office type employment, however, implies a value for CBD employment of less than 30%, a less than proportionate increase. It must be remembered that these measures of correlation do not, by themselves, show that a

CONSTRUCTION OF NEW DWELLING UNITS
PERCENTAGE INCREASE 1960 - 1971

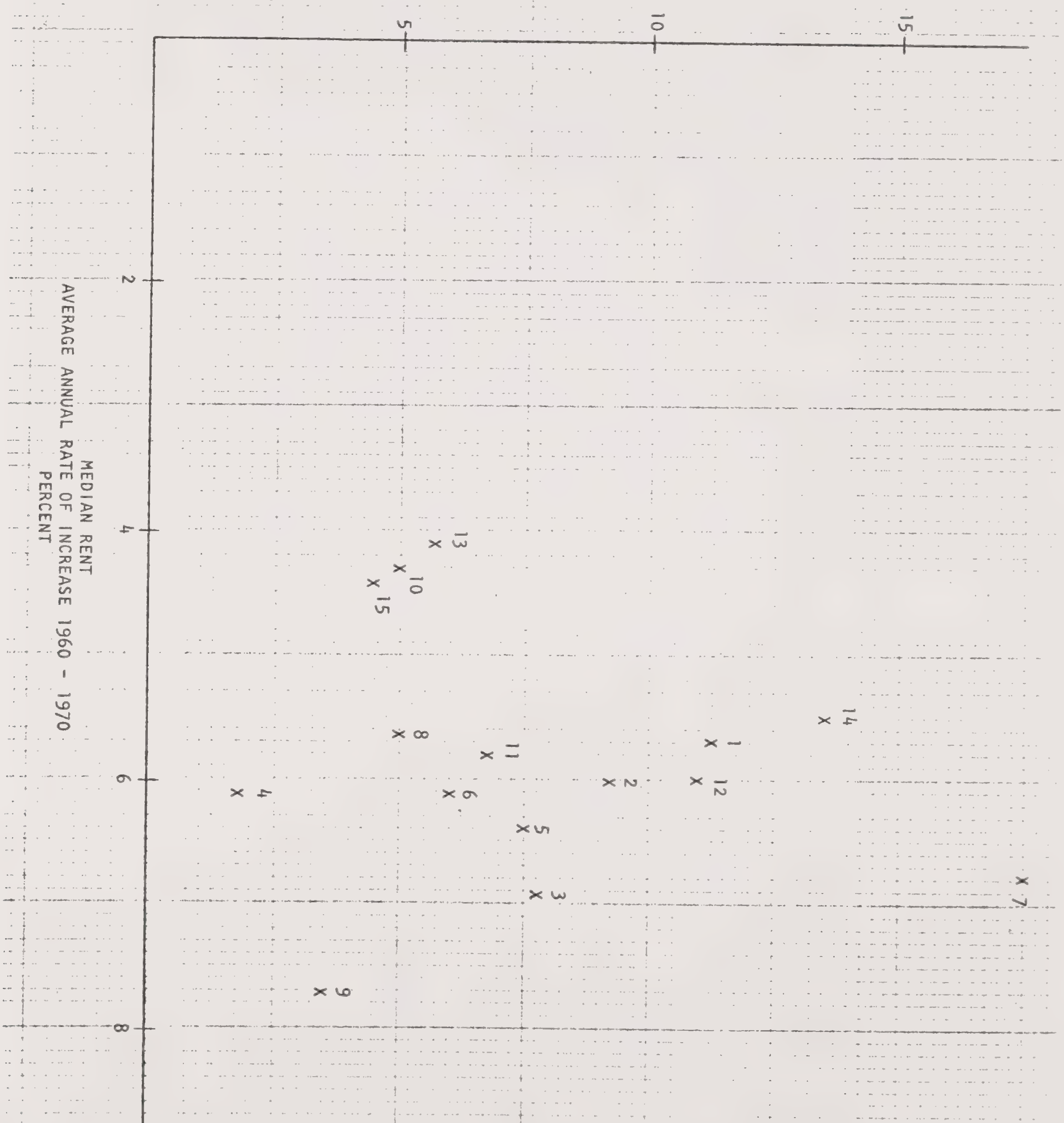


FIGURE 2

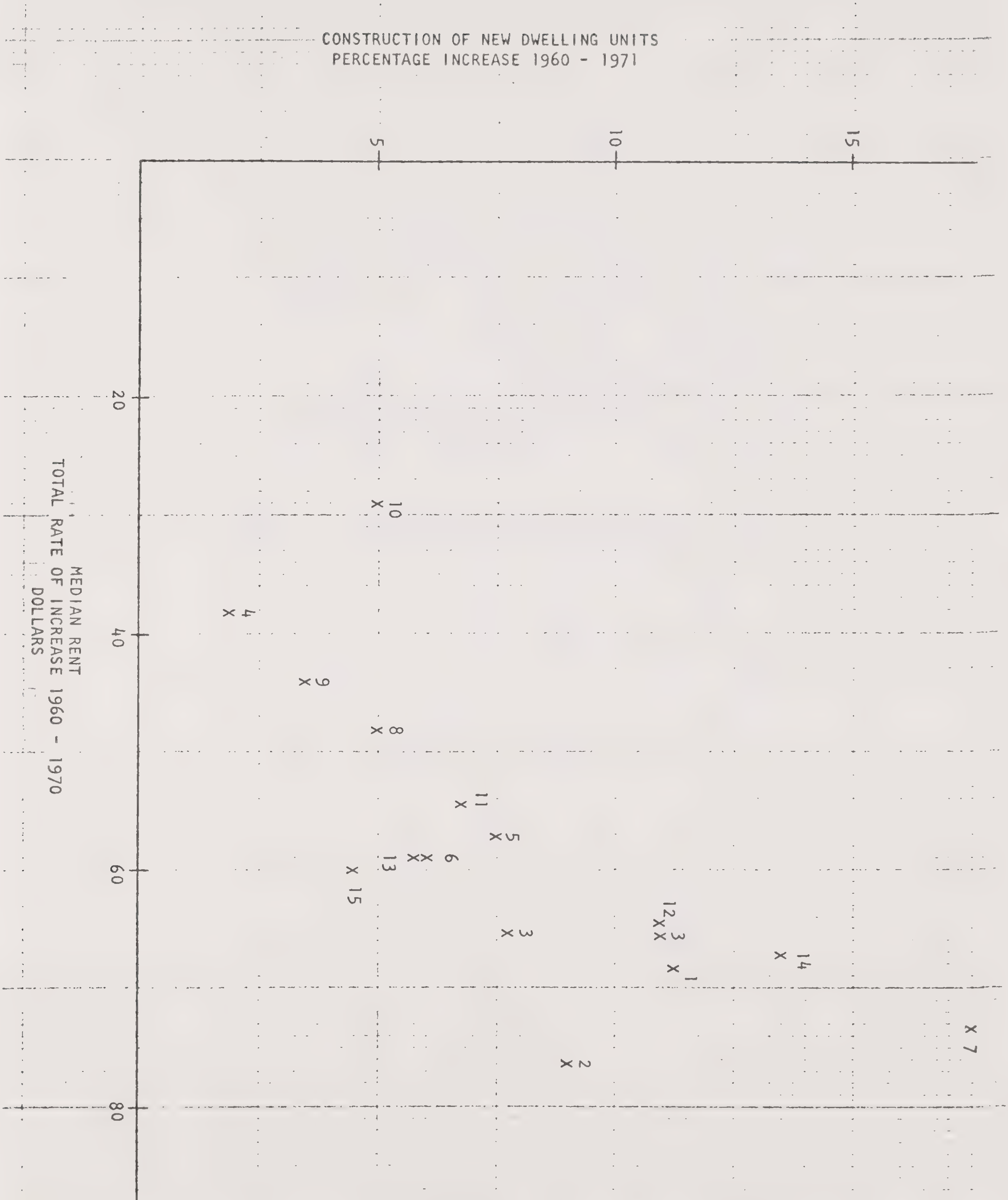

CONSTRUCTION OF NEW DWELLING UNITS
PERCENTAGE INCREASE 1960 - 1971
5
10
15
MEDIAN RENT
TOTAL RATE OF INCREASE 1960 - 1970
DOLLARS
20
40
60
80
10
4
9
8
11
5
13
6
15
3
12
3
1
14
7
2

FIGURE 3

change in one variable causes a change in another. Both could be measuring the effect of a third, as yet undefined variable. What they do show is a pattern of associations between the variables that can be useful to both for prediction and for deciphering the pattern of structural relationships that govern the market place.

The next two graphs show how the form in which the variable is expressed will affect the degree of correlation. In these graphs, residential construction rates, expressed as a percentage increase over the base year 1960, are compared with an increase in rents. The graph in figure 2 expresses the increase in rents as an average annual percentage increase. The graph shows little relationship between the two variables; the points are almost randomly scattered. The graph in figure 3, by contrast, expresses the rental increase in dollars, and a relationship begins to appear. A line fitted to the points would rise very steeply going to the right.

Without introducing other evidence, the graph suggests that dollar increases in rent are more powerful indicators than percentage increases of local construction activity. There are several ways in which this result might be explained. One of the most likely explanations is that there is a threshhold level of rental increase necessary for new construction to be profitable in many of the neighborhoods. Rents in those neighborhoods are so low that even a large percentage increase results in a rent level that will not make new market-rate construction profitable. Note that three of the four left-most points on the graph represent the broad band stretching south from Market Street, and the fourth point is the Downtown itself.

The next two graphs, figures 4 and 5, get at one of the high-rise relationships we are pursuing. This graph plots percent of employed residents with work place in the CBD against the increase in house value in each neighborhood. Again, the form of the variable makes a difference. In figure 4, house value is expressed in absolute dollars, and a strong relationship emerges. When the change in house values is expressed as an average annual rate of increase, as in figure 5, the relationship appears to weaken.

In this case, the graph in which percentage changes are used is preferable on theoretical grounds. Since high-rise CBD neighborhoods also tend to be high-income neighborhoods, the use of absolute values in this case may tend to overstate the proportional relationship in which we are interested. In this context, it is interesting to examine the two neighborhoods in figure 5 that deviate most strongly from the expected

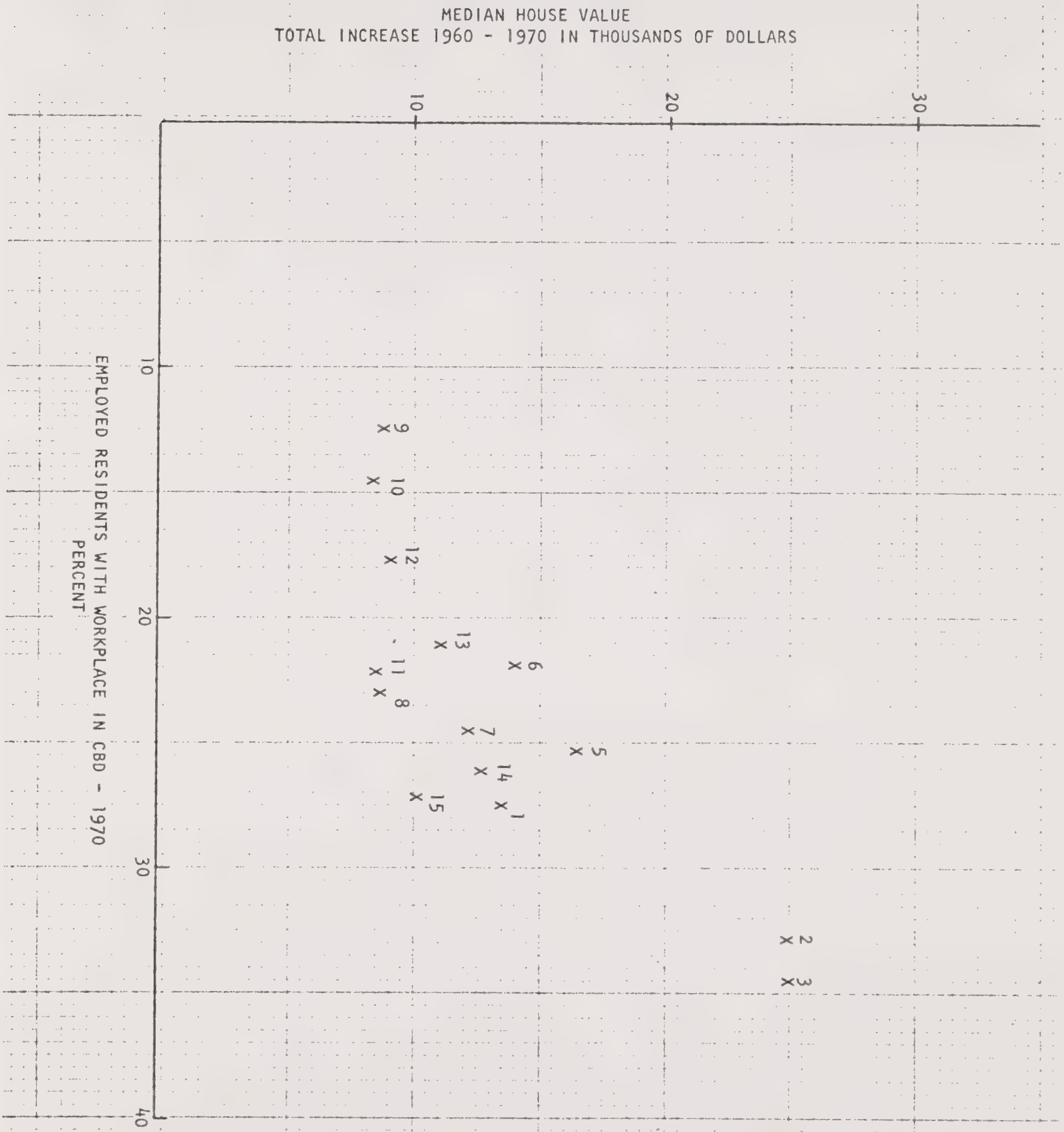

MEDIAN HOUSE VALUE
TOTAL INCREASE 1960 - 1970 IN THOUSANDS OF DOLLARS
10
20
30
EMPLOYED RESIDENTS WITH WORKPLACE IN CBD - 1970
PERCENT
10
20
30
40
9
10
12
13
6
11
8
7
5
14
15
1
2
3

FIGURE 4

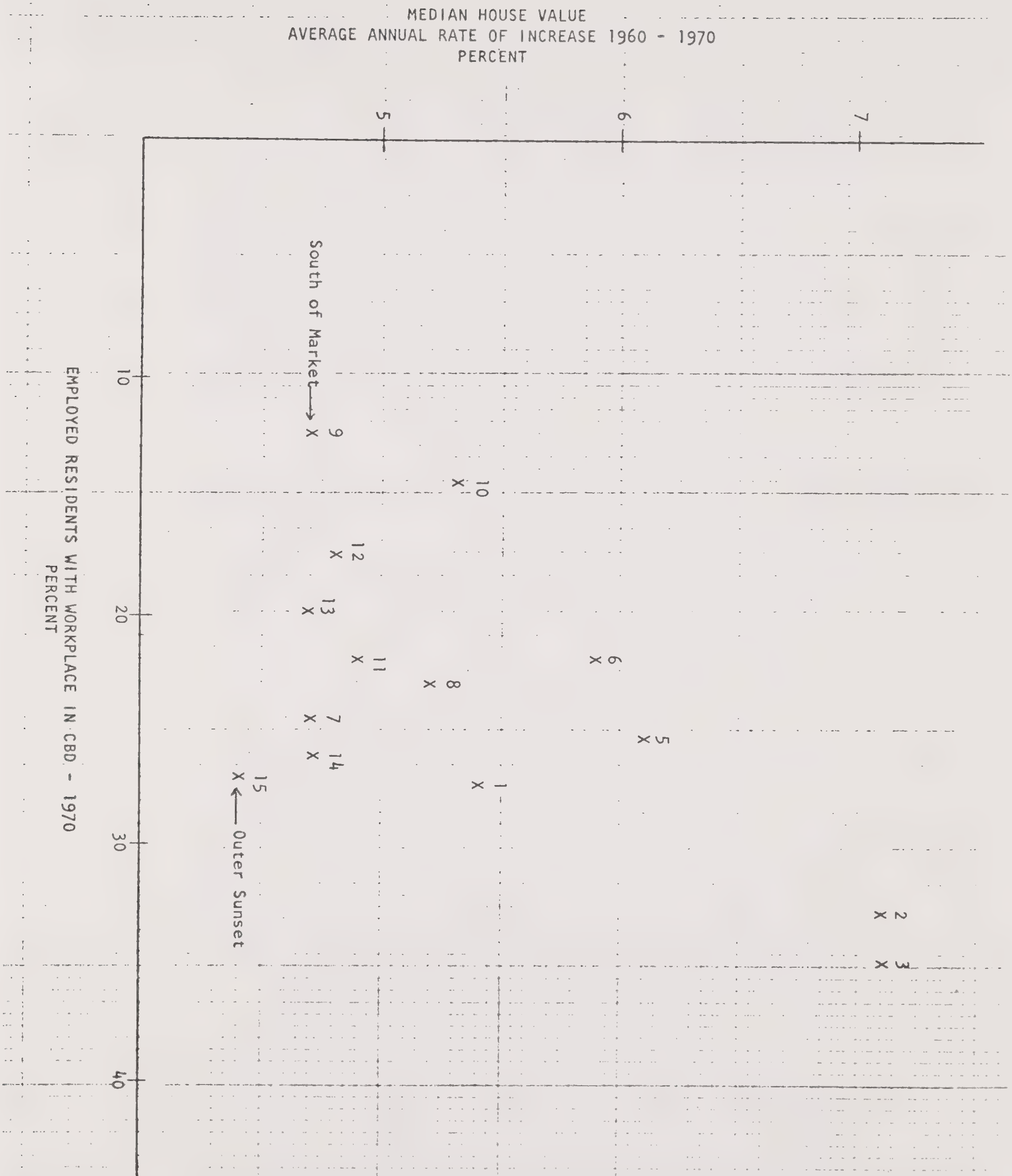

MEDIAN HOUSE VALUE
AVERAGE ANNUAL RATE OF INCREASE 1960 - 1970
PERCENT
5
6
7
EMPLOYED RESIDENTS WITH WORKPLACE IN CBD - 1970
PERCENT
10
20
30
40
South of Market
Outer Sunset
1
2
3
5
6
7
8
9
10
11
12
13
14
15

FIGURE 5

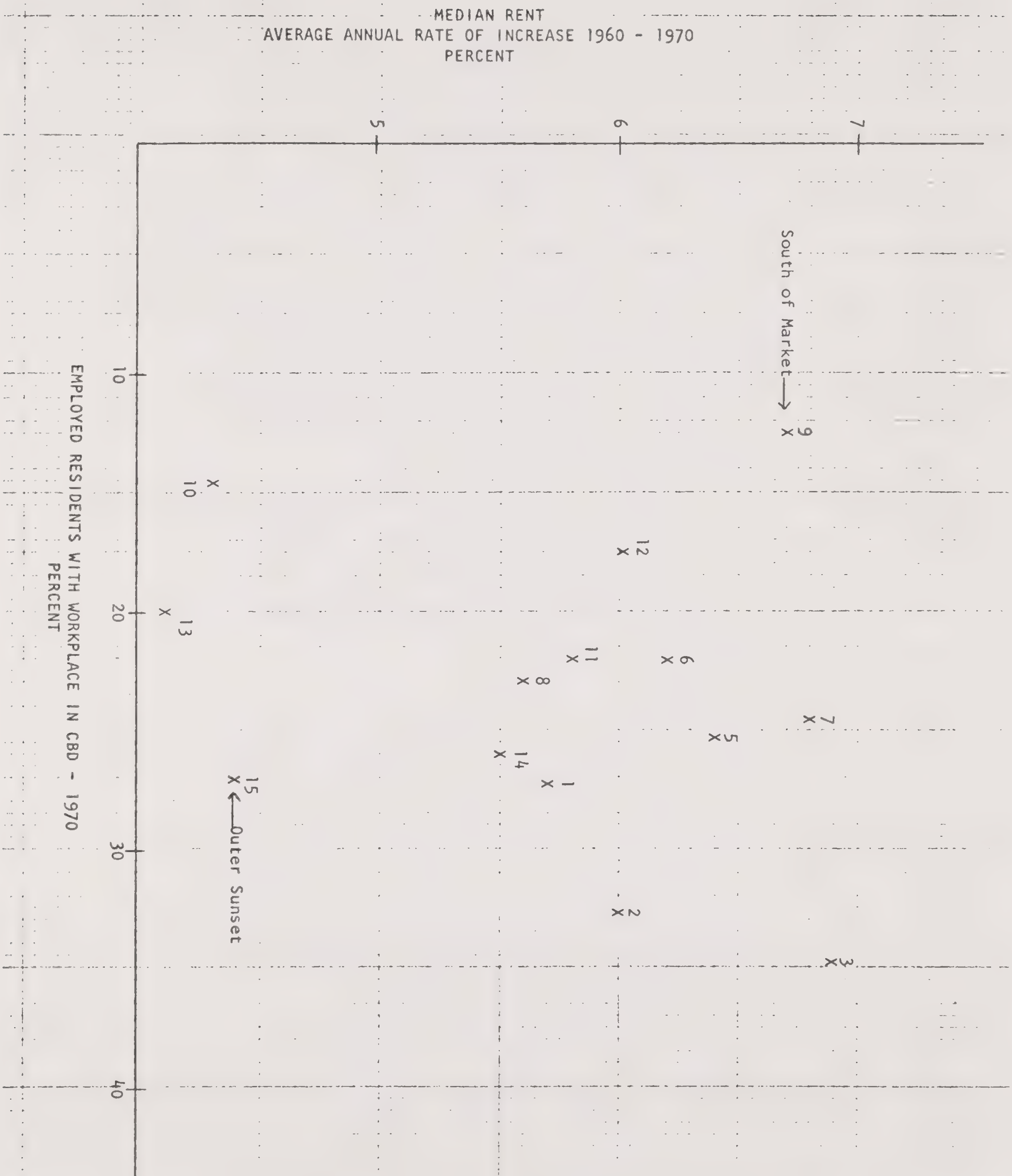
relationship--(9) South of Market and (15) Outer Sunset. The most likely explanation in the case of the Outer Sunset is that while the percent employed in the CBD is high, it is not increasing (Remember our data refers to one point in time, 1970). The neighborhood ranks high in the percentage of persons who commute outside of San Francisco to work, and this tendency seems to be increasing over time. South of Market, with its higher than anticipated rate of increase in housing value, presents more of a mystery. None of the neighborhood redefinitions we experimented with eliminated this upward deviation, nor did out-commutation figures provide a clue. The suspicion is that some long-term speculation in housing how much is there is occurring. Another possible explanation would relate to temporary housing market phenomena associated with the expansion of the Hunters Point community into the Potrero. Clearly, additional research is needed before such conclusions can be reached.

maybe shortage.

The analysis of these graphs gives us a clue to understanding the one in figure 6 where the rate of increase in rents is plotted against the percent employed in the CBD. No observable relationship exists; again, the points appear to be randomly scattered. Note, however, that again South of Market and the Outer Sunset are at the periphery of the plotted points. If these are removed, the remaining points would represent a line rising to the right in accordance with our hypothesized relationship. Even with the suppression of these two points, the variance that remains suggests that the introduction of another variable would strengthen the analysis.

Figure 7 shows the rate of increase in rents plotted against access time to the CBD. There is a strong relationship in accordance with our expectations, and the South of Market and the Outer Sunset no longer deviate from the expected relationship. Significant deviations on this plot include: (7) Central (including the Noe and Eureka Valleys and Diamond Heights) and (10) South Bayshore. The deviation of the Central district might be attributed jointly to the redevelopment activity at Diamond Heights (primarily market rate housing to date) and to a rapid rate of increase of CBD employment among neighborhood residents that appear to be occurring there even though no firm data is available. The deviation of South Bayshore is more difficult to explain and needs additional research.

This process of visual plots was extended to other variables of interest with similar results. On this basis, we began to calculate a simple correlation matrix to provide a mathematical check on visual impressions and to serve as a guide for the selection of variables for inclusion in a regression equation. As usual, correlations range between "0" and "1," with "1"



MEDIAN RENT
AVERAGE ANNUAL RATE OF INCREASE 1960 - 1970
PERCENT
5
6
7
EMPLOYED RESIDENTS WITH WORKPLACE IN CBD - 1970
PERCENT
10
20
30
40
South of Market
Outer Sunset
1
2
3
5
6
7
8
9
10
11
12
13
14
15

FIGURE 6

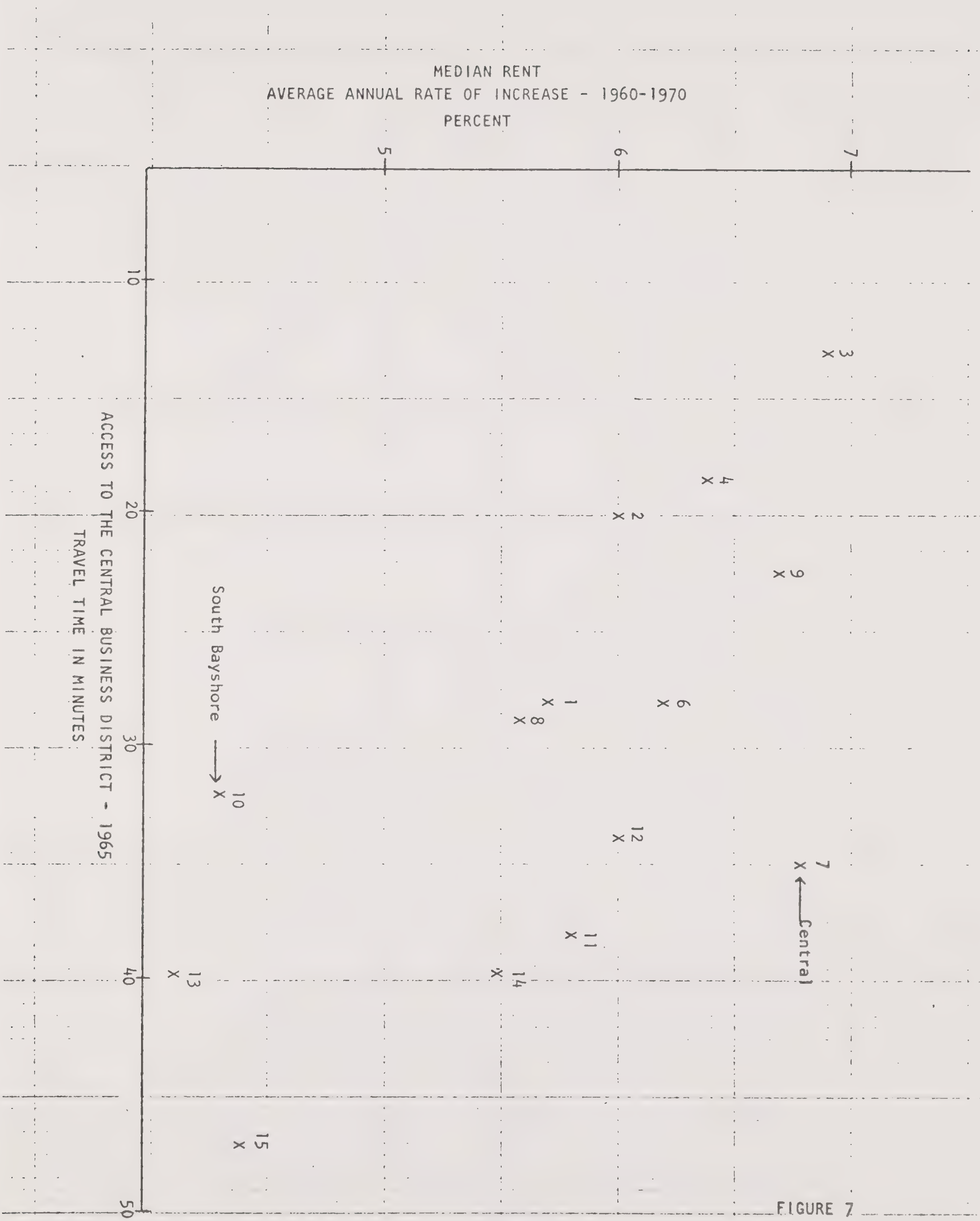

MEDIAN RENT
AVERAGE ANNUAL RATE OF INCREASE - 1960-1970
PERCENT
5
6
7
10
20
30
40
50
ACCESS TO THE CENTRAL BUSINESS DISTRICT - 1965
TRAVEL TIME IN MINUTES
South Bayshore
Central
1
2
3
4
6
7
8
9
10
11
12
13
14
15

FIGURE 7

indicating perfect correlation. The kind of results we obtained are illustrated in the following table:

	Access	Change in Rent	Change in Value	% Empl. in CBD	% Change in Office Type Empl.	Housing Construc. Rate
Access	1					
Rent Change	.66[1]	1				
Value Change	.38[1]	.39[1]				
% CBD Employed	.27	.71[2]	.79[2]	1		
% Change in Office Type Employment	-	.50[1]	-	-	1	
Housing Const. Rate	.11	.69[2]	.15[2]	.33	-	1

1) Percentage change in house value or rent.
2) Dollar change in house value or rent.

In general, the computed correlations confirm the visual impressions. Note particularly the high correlations between CBD employment and house value changes and between access and rental changes. Most of the correlations are not overly significant statistically, but this is a result of the extremely small sample size we used. If these correlations hold when the sample size is increased, we can begin to have some confidence in the relationship we are measuring.

In the second stage of this analysis we will refine our data and use multiple correlation and regression techniques. From the results of the first stage, we can select the variables and the forms of expression to be used and specify the nature of the relationships that we expect to find. A priori, we expect to be able to specify some linear relationships between the variables and employ ordinary least squares, linear regression techniques. In our preliminary calculations, taking two variables at a time, this approach did produce reasonable measures of correlation, even though the small sample size ($n = 14$) limited the strict statistical significance of the results. When experimental calculations of multiple correlations using several variables at a time were made, several technical problems were encountered which we believe can be overcome through the use of more sophisticated regression techniques. On balance, the analysis appears feasible and will offer additional understanding of the ways in which neighborhood impacts of our Step 2 development alternatives may be projected.

TABLE D-11

DWELLING UNIT MIX IN SURVEYED
BUILDINGS 10 STORIES AND OVER
SAN FRANCISCO, 1972

Area	Studio	One Bedroom	Two Bedroom	Three or more Bedroom	Total
San Francisco	1,998	2,033	1,634	693	6,420
Percent	31%	32%	26%	11%	100%
Central Business District	1,396	446	241	27	2,110
Percent	66%	21%	12%	1%	100%
Golden Gateway	389	530	269	8	1,196
Percent	33%	44%	22%	1%	100%
Western Addition	87	261	156	180	684
Percent	13%	38%	23%	26%	100%
Marina and Pacific Heights	26	217	255	131	629
Percent	4%	35%	41%	21%	100%
Nob Hill	10	91	349	188	638
Percent	2%	14%	55%	29%	100%
Russian Hill	8	206	178	134	588*
Percent	2%	39%	34%	25%	100%
Chinatown	-	-	60	12	72
Percent			83%	17%	100%
Northern Waterfront	62	102	86	13	263
Percent	24%	39%	33%	5%	100%
Other	20	180	40	-	240
Percent	8%	75%	17%		100%

* Unit total is 588. Individual unit size counts do not add to 588 because breakdown is not available for one building.

Source: Keyser/Marston & Associates

4. High-Rise Residential Opportunities

This section focuses on the kinds of housing opportunities that will be made available in high-rise residential buildings under the overall development alternatives that would be considered in steps 2, 3, and 4 of the study. Based upon our analysis of available data, we believe that given a policy alternative--such as free market development or tight height and bulk controls --we can make reasonable forecasts of certain aspects of the role that high-rise residential construction will play in the San Francisco housing market and in determining the nature of the city's urban form. In particular, we can specify where high-rise residential construction is likely to occur, the density and height at which it could economically be constructed and the type and price range of dwelling units it would contain. We can also suggest ways in which these forecast estimates can be linked to property tax revenues, with important implications for the study of municipal fiscal structure.

The paragraphs that follow will discuss the data sources we have used, some of the results that we have obtained, the kinds of impact estimates that appear feasible, and some suggestions for further study.

a. Data Sources

The basic data source on the neighborhoods in which high-rise residential buildings are located is the 1970 Census of Population and Housing. Data on the high-rises themselves was drawn from building permit data, assessors records, and interviews with private sources knowledgeable in the local real estate market. Data on construction and operating costs has been located in the publications of the Building Owners and Managers Association, the Stevens Valuation Quarterly and a variety of previous public documents such as the 1965 San Francisco Community Renewal Program study.

We began with a 100% sample of non-subsidized residential buildings 10 stories and over in height. The 10 story definition was taken from the periodically updated list of downtown area tall buildings maintained by the Department of City Planning. Although the definition is somewhat arbitrary, we believe that a variation of 1 or 2 stories in either direction would not significantly change the conclusions reached here. A definition that established the lower limit at less than 6 stories would cause the inclusion of large numbers of older buildings that constitute a separate housing market. A definition including only buildings over 13 stories--the approximate point at which steel-frame rather than reinforced concrete construction becomes mandatory under the building code--would exclude many of the larger, new buildings that have been the focus of controversy.

TABLE D-12

DWELLING UNIT MIX IN SURVEYED CONDOMINIUMS AND CO-OPERATIVE BUILDINGS 10 STORIES AND OVER
SAN FRANCISCO, 1972

Area	Studio	One Bedroom	Two Bedroom	Three or more Bedroom	Total
San Francisco	257	344	568	222	1,391
Percent	19%	25%	41%	16%	100%
Central Business District	194	181	114	21	510
Percent	38%	35%	22%	4%	100%
Golden Gateway	-	-	-	-	0
Percent					
Western Addition	1	17	68	17	103
Percent	1%	17%	66%	17%	100%
Marina and Pacific Heights	-	-	-	14	14
Percent				100%	100%
Nob Hill	-	35	169	92	296
Percent		12%	57%	31%	100%
Russian Hill	-	9	71	53	133*
Percent		7%	53%	40%	100%
Chinatown	-	-	60	12	72
Percent			83%	17%	100%
Northern Waterfront	62	102	86	13	263
Percent	24%	39%	33%	5%	100%
Other	-	-	-	-	0
Percent					

* Data not complete

Source: Keyser/Marston & Associates

TABLE D-13

TYPICAL RENTALS BY UNIT TYPE
BAY AREA RESIDENTIAL BUILDINGS
10 STORIES AND OVER

Area & Sample	Height	Monthly Contract Rent				Year of
Building #	Category	Studio	1 Br.	2 Br.	+ 3 Br.	Rental Data
CBD						
1	20+	95-141		160-295		1965
2	10-15	155-170				1972
3	10-15	80-100				1969
4	15-19	149-195[1]	131-190			1965
Western Addition						
1	15-19				280-310[3] 335-360[4]	1967
2	20+	175-220	250-320	360-440		1965
3	10-15	200-250	245-300	300-400	300-400	1965
Marina & Pacific Hts.						
1	10-15		210-300	285-500[2]	350-500	1967
2	10-15		190-225	190-340		1970
3	10-15	160-195	210-240	320-425		1967
4	15-20		205-300	245-340		1964
Nob Hill						
1	10-15	250-290	275-455	495-525		1972
2	20+			235-475	600-750	
Russian Hill						
1	10-15		200-260		405-560	1970
2	15-19				250-375	1968
3	10-15		165-285 175-290 155-250	175-290 180-295		 1963
4	20+		285-410	425-660	550-655	1964
Other						
1	10-15	110-125	145-165[5]	195[5]		1965

1) Furnished.
2) High end furnished.
3) Center apartments.
4) End apartments.
5) Plus an increase of $5 every two floors.
Source: Keyser/Marston & Associates

TABLE D-14

DISTRIBUTION OF SURVEYED RESIDENTIAL BUILDINGS
10 STORIES AND OVER AND DWELLING UNITS BY TENURE
SAN FRANCISCO, 1972

	Buildings			Dwelling Units		
	Rental	Co-Op. or Condominium	Total	Rental	Co-Op. or Condominium	Total
San Francisco	53	17	70	5,029	1,391	6,420
Percent	76%	24%	100%	78%	22%	100%
Central Business District	14	5	19	1,600	510	2,110
Percent	74%	26%	100%	76%	24%	100%
Golden Gateway	4	0	4	1,196	0	1,196
Percent	100%	-	100%	100%	-	100%
Western Addition	5	1	6	581	103	684
Percent	83%	17%	100%	85%	15%	100%
Marina and Pacific Heights	13	1	14	615	14	629
Percent	93%	7%	100%	98%	2%	100%
Nob Hill	8	4	12	342	296	638
Percent	67%	33%	100%	54%	46%	100%
Russian Hill	8	3	11	455	133*	588
Percent	73%	27%	100%	77%	23%	100%
Chinatown	0	1	1	0	72	72
Percent	-	100%	100%	-	100%	100%
Northern Waterfront	0	2	2	0	263	263
Percent	-	100%	100%	-	100%	100%
Other	1	0	1	240	0	240
Percent	100%	-	100%	100%	-	100%

* Data not complete

Source: Keyser/Marston & Associates

The tabulations of our basic data discussed in this report exclude a number of buildings on which no usable information other than height was available. After these exclusions, the overall sample size was approximately 70. Some tabulations cover a slightly smaller number of buildings due to confidentiality limitations. It should also be noted that our data is presented in summary form and that additional cross-tabulations of the data in our possession are possible in later phases of the study as the need to refine our analysis may arise. We performed only sufficient tabulations to convince ourselves of the reliability and usability of what had been collected.

Using this data, we began an initial test of our method housing opportunities provided by high-rise residential buildings. The general procedure was to compare the type and cost of space provided in these buildings with the type and cost of space available in non-high-rise buildings in the same neighborhoods. Variations in type and cost of space were also correlated with certain locational characteristics of the buildings, so that these results could be directly linked to our analysis of the future emergence of high-rise residential buildings to be used in the scenarios of city development that we will derive in later study steps.

Table D-11 shows the general distribution of dwelling unit mix in high-rise buildings by area of the city. Overall, studio units and one-bedroom units predominate--comprising almost 2/3 of the present stock-followed by two-bedroom, and three-bedroom and larger, units in that order. This general pattern changes according to both location and tenure. Only buildings within the Central Business District or immediately adjacent to it, such as the Golden Gateway, have a high proportion of studios. In other areas, one-bedroom units predominate. The hilltop areas--Russian Hill and Nob Hill--have the highest proportion of larger units.

Table D-12 shows the effect of tenure on unit mix. In general, condominium and cooperative units have a higher than average proportion of three-bedroom and larger units, numerically greater than the number of one-bedroom units. The backup data for this table indicate that this tendency is even more pronounced in buildings built since 1960. Additionally, in our data we were able to identify only one cooperative built since 1960 that contained more than a single studio unit.

Table D-13 shows rental ranges for high-rise buildings by area. The width of the range reflects two influences. Standard real estate analysis separates the high-rise residential market into two sub-markets, "luxury" and "middle to upper-income". Buildings constructed for the two markets differ significantly

TABLE D-15

AVERAGE CONTRACT RENT PER ROOM
SAN FRANCISCO NEIGHBORHOODS

Area	Buildings 10 Stories & Over	Buildings Non High-Rise*
Central Business District	$ 60**	$ 63
Northeast	90	48
Nob Hill	112	55
Russian Hill	78	44
Marina (Incl. Pacific Hts.)	80	53
Western Addition	83	37

* All residential units on blocks without any high-rise development.
** 1969 Dollars.
Source: Keyser/Marston & Associates

in room size per unit type and in the number and quality of amenities offered--such as fireplaces, doormen, etc. Yet another influence is the height of the building itself. Rent per unit or per square foot is higher in units that are located higher up within the building. We obtained a sub-sample of 18 buildings in which we could identify the rentals for equivalent units on different floors. Overall, in these buildings rents increased by approximately 3% per floor. As a hypothetical example, a 20 story building with a base rental of $200 per month for first floor units would offer top floor units for $360 per month. This finding will play in our calculations of economic feasibility discussed below.

Table D-14 shows tenure by area. Two tendencies can be noted. Very few condominium units are located in the CBD (separate data indicate that these are mostly older buildings originally built as apartments and converted to condominium ownership in recent years). Most condominium units are found in the most intensively developed high-rise residential areas, and in those areas they constitute a much larger than average percentage of total high-rise residential units.

Comparison of the type and cost of high-rise dwelling units with non-high-rise dwelling units is a relatively straightforward task. The data we need comes directly from the 1970 Census volumes PHC (1) covering tracts in the SMSA and HC (3) covering blocks. The latter publication, in particular, offers a great deal of analytic flexibility because it offers a means of comparing our data on high-rise dwelling units with data on non-high-rise dwelling units, either on the same block or on different, non-high-rise blocks in the same neighborhoods.

Since this high degree of data availability strongly suggests the feasibility of our procedure, we have calculated only one such comparison by way of illustration. Table D-15 compares average rent per room by neighborhood for high-rise buildings and for buildings in the same neighborhoods on non-high-rise blocks. These differences slightly overstate the true difference in total dwelling unit rent since there is a tendency for non-high-rise units to contain a larger number of rooms. Nonetheless, unless it could be proved that high-rise residents spend a much larger proportion of their income on rent than is average for their income class, the calculated differences suggest a significant degree of income disparity between high-rise residents and their neighbors.

Similar comparisons are possible for other characteristics and would be the subject of a Step 3 effort.

TABLE D-16

DISTRIBUTION OF SURVEYED RESIDENTIAL BUILDINGS 10 STORIES AND OVER
SAN FRANCISCO, 1972

Area	Buildings	Units	Units as & of Total Units
Central Business District	19	2,110	32.9%
Northeast	30	2,757	43.0%
Nob Hill	12	638	9.9%
Russian Hill	11	588	9.2%
Golden Gateway	4	1,196	18.6%
Northern Waterfront	2	263	4.1%
Chinatown	1	72	1.1%
Marina (Includes Pacific Heights)	14	629	9.8%
Western Addition	6	684	10.6%
Other	1	240	3.7%
Total	70	6,420	

Source: Keyser/Marston & Associates

b. Where High-Rise Residential Buildings Are Located

Before proceeding to an examination of the economics of high-rise residential construction, it is useful as a guide to the construction of development alternatives that will occur in Step 2, to examine some of the high-rise residential locational tendencies that can be discovered in our data. Table D-16 recapitulates data on buildings and shows the percentage distribution of high-rise dwelling units. Aside from the obvious influence of zoning, a great deal of this pattern can be explained in terms of only three variables: access, prestige, and topography.

Access to the CBD, presumably to the job opportunities there (and to a lesser extent, entertainment and shopping) appear to be of high importance. Over 30% of the high-rise units are in the CBD itself. Adding the area immediately adjacent to the Financial District--Golden Gateway and Nob Hill--brings the total to over 60%. All of the remaining high-rises are located in neighborhoods adjacent to the CBD on the west and north. This conclusion is reinforced by the private surveys of high-rise dwellers we have surveyed. The access offered by the location of the high-rise in which they lived was cited by the residents as one of the most important factors in this residential choice. Access alone, however, is not sufficient to account for the locational pattern for none of the neighborhoods adjacent to the CBD on the south and west--Buena Vista, Mission, and South of Market (the latter including the Potrero and India Basin)--have received any development over 10 stories at all.

Some of the variance not explained by access can be attributed to prestige. Prestige is a difficult variable to quantify, yet it is one on which a relatively stable consensus can be reached among real estate practisioners. Most of the high-rise residential buildings surveyed are located in areas that were high-prestige areas prior to the initiation of high-rise residential construction. Although some of our surveyed buildings are located in what are now relatively low-prestige areas in the western part of the CBD, these are largely older buildings constructed in an era when relative access and prestige conditions were quite different. An important exception to this rule can be noted with respect to the Golden Gateway and Cathedral Hill developments. In those cases larger scale public action created the potential for prestige upgrading on sites that were desirable on the basis of other criteria--such as access.

Another important element in the pattern appears to be topography. The most intensive high-rise development is found in areas that are both on hilltops and offer views of the bay (or

TABLE D-17

MEDIAN GROSS RENT PAYMENTS
BY INCOME CLASS
SAN FRANCISCO, 1970

Family Income Classes	Number of Families	Percent of all Families	Median Gross Rent as a Percent of Household Income	Calculated Range of Monthly Rental Payments
- $5,000	30,941	18.7%	35.0%	$145.80
$5,000 - $10,000	46,937	28.3%	23.5%	$ 95.80 - $195.80
$10,000 - $15,000	42,565	25.7%	16.4%	$136.60 - $205.00
$15,000 +	44,899	27.2%	12.2%	$152.00 +
$25,000 +	9,647	5.8%	12.2%*	$254.16 +
$50,000 +	2,180	1.3%	12.2%*	$508.30 +

* No Census estimate available. Assumes previous percentage pertains.

N.B. Household income and family income are not synonomous. Households can consist of unrelated individuals. Working estimates of household income distribution yielded a very similar percentage distribution. These figures were used to offer more precision without affecting the basic conclusions.

Source: U.S. Census
Keyser/Marston & Associates

ocean). The development along the waterfront (Fontana Towers and Golden Gateway) suggests that bay views alone may be sufficient. The developments around Cathedral Hill suggest that a hilltop location alone may be sufficient. With the possible exception of Fox Plaza in the CBD, a unique development on several counts, there is no case of market rate, high-rise residential development at a low elevation, distant from the water.

This confirmation of the importance of views afforded by topography in site selection accord well with our earlier finding that within individual high-rise residential buildings, a substantial premium in monthly rentals (and in sales prices for condominiums) is paid for height. Another confirmation are the private surveys of high-rise residents mentioned above in which residents have consistently cited views as a primary factor in their choice of residential location. This multiple evidence of the economic importance of views in guiding high-rise residential development suggests an important modification of the analysis of economic feasibility of high-rise residential development proposed in the 1-A report.

c. Economic Feasibility

In our discussions of economic feasibility in the 1-A report we proposed to take some of the standard tools of real estate analysis and carry them a bit farther than is usually done in the private market. Essentially, we believe that an intensive examination of the small scale, micro-economic situation facing individual developers would reveal some significant conclusions about the role that high-rise residential would play at the macro-economic level of the city as a whole. We will retrace in outline the fundamental steps of that earlier proposal and show how our data of economic importance of views will modify our approach and our projections.

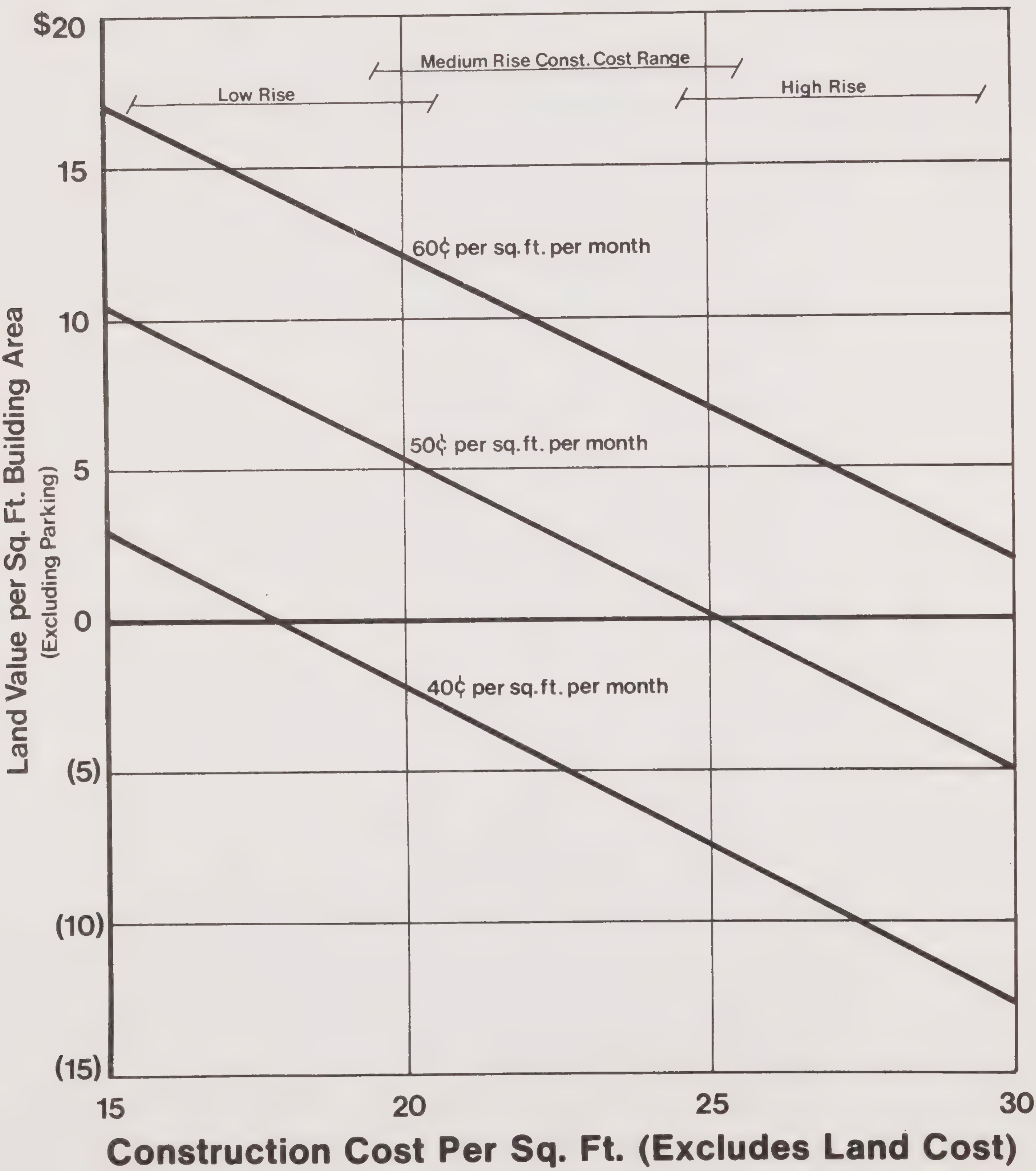
The process begins with an estimation of potential market demand for space in high-rise residential buildings. This is done regularly by developers and their analysts and the procedures are well-known and well-tested. Basically the process begins with the definition of a primary trade area and an estimation of the proportion of the population within that trade that has the income and demographic characteristics necessary to constitute potential demand. An example of an initial calculation that would be done is shown in Table D-17, using Census estimates of income distributions and proportion of income spent on housing. In practice the market can be much more finely segmented.

The next step is to consider the advantages and disadvantages of potential development sites--access, prestige, views along with a variety of other factors such as land assemblage and what the competition is likely to be doing--and devise an estimate of

Cost/Rent/Land Value Relationships

(Assumes Constant Financing at 9% for 35 Years, at Constant Rate of Return)

OFFICE



market share that could be captured by development at that site. This market share can be translated into a probable absorption rate over time. Based on the absorption rate that developers (and financial institutions) have historically been willing to accept, a first approximation of an economically feasible scale for the process can be reached.

At this point the analysis becomes more complicated, because the joint effect of a range of additional variables must be considered. For our purposes the most important of these variables include land cost, construction cost, rental levels, allowable floor area ratios, developer profits and taxes. In the abstract these variables might be embodied in a set of equations and solved for equilibrium or constrained maximization values. The solution would specify whether or not the project is built, or the implied return to land and capital, and would specify what we are most interested in, scale and height. In practice, the solution is much less elegant. Typical or trend values are assumed for key variables and a first approximation of profitability is devised. Then, assumed values are allowed to vary to test their effect upon profitability, and through repeated iterations of the process, including re-estimation of the market potential as scale and required rent vary, structural relationships between the variables can be estimated. An example is reproduced from the 1-A report on the opposite page. In the end, a maximization solution of sorts is reached. The marginal analysis of micro-economic theory may be implicit in this process, but as Berger (1968) found, it is rarely consciously adopted.

The Economic Importance of Views

The economic importance of views enters this process in several ways. First, rental levels achievable are a function of the height of the project itself. Although the incorporation of this relationship complicates the analysis somewhat, the obvious conclusion is that under most conditions, the height premium reflecting views results in the construction of higher buildings than would otherwise be economically feasible.

Second, and more significant, a final determination of economic feasibility on any given site requires an examination of the density of high-rise development on adjoining sites. If the calculations of economic feasibility for a proposed development yield a building that is no larger than existing buildings surrounding the site under consideration, the view premium cannot be captured and the development is still not feasible. In this situation the developer has two basic choices: 1) postponement of development until sufficient market demand exists for construction at a higher scale where the new premium can be captured, or 2) changing the site of the

proposed development to the periphery of existing high-density development or a new location entirely. Thus, our model of the decision making process predicts both the construction of larger high-rises in areas of existing high-rise development and the dispersion of new high-rise buildings to areas not currently developed in that fashion. An additional implication of the model is that for any given neighborhood at any given point in time, there is a maximum feasible density of high-rise development.

Another economic effect of the view premium can be found to result when the hypothetical developer discussed above carries out a development profitable to him--after all his calculations have been made--that blocks the views of existing high-rise development. If the view premium works in reverse, one can expect that the value of dwelling units with blocked views would decline. The condominium resident would suffer a loss on his investment. The apartment dweller might be able to negotiate lower rents, but the building owner has suffered a loss.

Aside from these private economic losses, the municipal financial structure could be impacted. Lower property values will, of course, result in lower tax revenues. This implies that any municipal cost-revenue calculations made by public officials as a decision-making aid prior to the construction of those developments that have suffered new blockage would no longer hold. As value declined, revenues would be reduced while municipal costs would remain eventually unchanged.

All of these effects appear amenable to study though at different levels of detail. Calculations of economic feasibility are relatively straightforward and would use many of the same techniques that we have accomplished in private market studies. The most important difference for this study would be a greater geographical extension of the analysis and less attention to precise dollar costs of minor environmental amenities such as balconies, fireplaces, etc. Much data on land costs, construction costs, operating costs, rentals and potential market are already in our possession and can be supplemented quite easily. Necessary supplements to what has been collected can be determined in Step 2 as the policy questions to be considered in our development alternatives, or scenarios, are finalized.

Analysis of the economic effects of view blockage in already constructed high-rises is somewhat more difficult because of the lack of good measures of the physical or psychological extent to which views can be considered to be blocked. Nevertheless, we believe that an analysis of the floor and building--specific rental data already collected on 18 of our sample high-rise buildings, supplemented by on-site, field examination of the sample buildings themselves will yield some highly suggestive results that are not otherwise available. This work, too, would be accomplished as a Step 3 item following the scenario development of Step 2.

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Appendix D-1

SAN FRANCISCO NEIGHBORHOODS
1960 CENSUS TRACT CODE

1. RICHMOND

D-1
D-2
B-8
J-4
J-5A
E-1
E-2
E-3
F-1
G-1
G-2
G-3
G-4
H-1
H-2

2. MARINA

B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-9
B-10

3. NORTHEAST

A-1
A-2
A-3
A-4
A-5
A-6
A-7
A-8
A-9
A-10
A-11
A-12
A-13
A-14
A-15
A-16

4. DOWNTOWN

A-17
A-18
A-19
A-20
A-21
A-22
A-23
K-2

5. WESTERN ADDITION

J-1
J-2
J-3
J-5B
J-6
J-7
J-8
J-9
J-10
J-11
J-12
J-13
J-14

6. BUENA VISTA

J-15
J-16
J-17
J-18
J-19
J-20

7. CENTRAL

N-3
N-4
N-5A
N-5B
N-6
N-11
N-12
N-13
N-14
N-15

8. MISSION

N-1
N-2
N-7
N-8
N-9
N-10
K-6
L-2
L-3

9. SOUTH OF MARKET

K-1
K-3
K-4
K-5
L-1

10. SOUTH BAYSHORE

L-4
L-5A
L-5B

11. BERNAL HEIGHTS

M-1
M-2
M-3
M-4

12. SOUTH CENTRAL

M-5A
M-5B
M-6
M-7
M-8
M-9
M-10
M-11

13. INGLESIDE

0-5A
0-5B
0-6
0-7
0-8A
0-8B
0-9
P-3B
P-3C
R-1

14. INNER SUNSET

0-1
0-2
0-3
0-4

15. OUTER SUNSET

P-1
P-2
P-3A
Q-1A
Q-1B

Appendix D-2

SAN FRANCISCO NEIGHBORHOODS
1970 CENSUS TRACT CODE

1. RICHMOND

133
154
156
401
426
427
428
451
452
476
477
478
479
602

2. MARINA

126
127
128
130
131
132
133
134
135

3. NORTHEAST

101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
118
119

4. DOWNTOWN

117
120
121
122
123
124
125
176

5. WESTERN ADDITION

151
152
153
155
157
158
159
160
161
162
163
164
165

6. BUENA VISTA

166
167
168
169
170
171

7. CENTRAL

203
204
205
206
211
212
213
114
215
216
217
218

8. MISSION

177
201
212
207
208
209
210
228
229

9. SOUTH OF MARKET

178
179
180
226
227
607

10. SOUTH BAYSHORE
(Hunters Point)

230
231
232
233
234
606
608
609

11. BERNAL HEIGHTS

251
252
253
254

12. SOUTH CENTRAL

255
256
257
258
259
260
261
262
263
264
605

13. INGLESIDE

307
309
310
311
312
313
314
331
332
604

14. INNER SUNSET

301
302
303
304
305
306
308

15. OUTER SUNSET

326
327
328
329
330
351
352
353
354

Appendix D-3

TRANSIT TIME ON PUBLIC TRANSPORTATION TO THE SAN FRANCISCO CENTRAL BUSINESS DISTRICT*
SAN FRANCISCO NEIGHBORHOODS
1965

																		Totals	Average Time
1. Richmond	Zone	44	48	49	50	51	52	53	54	55	56	57	58	59	64	65		15	
	Time	25	25	23	32	26	25	40	32	31	32	36	28	26	17	20		418	27.9
2. Marina	Zone	37	38	39	40	41	42	43	45	46								9	
	Time	26	20	22	15	20	17	22	20	18								180	20.0
3. Northeast	Zone	1	2	3	4	23	24	25	26	27	28	29	30	31	32	33	34	16	
	Time	14	17	6	9	16	15	15	15	15	8	14	17	18	13	12	7	211	13.2
4. Downtown	Zone	5	6	7	9	12	13	16	17	19	20	22	35	36				13	
	Time	13	18	18	16	14	10	10	-	13	9	6	11	8				146	11.2
5. Western Addition	Zone	8	61	62	63	66	67	68	69	70	71	72	73	74				13	
	Time	20	13	15	20	20	13	19	12	16	19	24	22	27				240	18.5
6. Buena Vista	Zone	75	76	77	78	79	80											6	
	Time	28	23	26	29	31	32											169	28.2
7. Central	Zone	125	126	127	128	129	134	135	136	137	138							10	
	Time	30	33	29	35	34	34	31	44	38	42							350	35.0
8. Mission	Zone	86	87	92	93	94	95	123	124	130	131	132	133					12	
	Time	27	29	27	29	36	32	21	28	36	24	27	29					345	28.8
9. South of Market	Zone	10	11	14	15	21	81	82	83	84	85	88	89	90	91			14	
	Time	18	16	13	12	17	17	21	19	35	20	33	24	38	23			306	21.9
10. South Bayshore	Zone	96	97	98	99	100	101	102	103	104								8	
	Time	33	30	32	27	34	31	32	35	-								254	31.8
11. Bernal Heights	Zone	105	106	107	108	109												5	
	Time	39	39	35	37	39												189	37.8
12. South Central	Zone	110	111	112	113	114	115	116	117	118	119	120	121	122				12	
	Time	32	30	33	-	38	37	35	24	33	36	33	45	28				404	33.7
13. Ingleside	Zone	162	163	164	165	166	167	168	169	170	171	172	146	147				13	
	Time	45	36	35	41	42	47	39	36	26	28	60	48	34				517	39.8
14. Inner Sunset	Zone	148	153	156	157	158	159	160	161									8	
	Time	39	38	36	41	42	37	44	38									315	39.4
15. Outer Sunset	Zone	139	140	141	142	143	144	145	149	150	151	152	154	135				13	
	Time	40	39	40	49	52	51	51	49	47	45	42	53	54				612	47.1

* Transit time to Zone #17 was used. Zone #17 is in the center of the CBD as defined by the U.S. Census and contains several blocks from Union Square to Market Street.

** Total number of zones and total number of minutes.

SOURCE: Transit Network Skim Tree, Prepared by Simpson & Curtin Transportation Engineers for the Bay Area Transportation Study District, 1965.

EMPLOYMENT BY INDUSTRY
SAN FRANCISCO CENTRAL BUSINESS DISTRICT*
1965

SIC NO.	A-17	A-18	A-21	A-22	A-23	K-2	Total
1- 9 Agriculture, Fur, Fishing	309	-		-	3		312
10-14 Mining	191	-	1	-		293	485
15-17 Construction	322	-	13	-	24		359
Manufacturing							
20 Food	521					400	
23 Apparel	407					2,042	2,449
27 Printing	2,292					3,440	5,732
21-39 Other	4,357	2	8	48	35	1,397	
Transportation							
40 Transportation - Railroads	74					4,717	4,791
41 Local Transit			117	1	173	1,948	2,239
42 Truck & Warehousing	148		8	16		179	351
44 Water Transportation	1,445					358	1,803
45 Air Transportation	933	340	47			106	1,426
47 Transportation Services	1,051	42	63			117	1,273
48 Communications	2,734	-	68	10	436	3,794	7,042
49 Utilities	61	-	-	-	-	3,184	3,245
50-51 Wholesale Trade	7,879	42	30	195	256	5,510	13,912
Retail							
52 Building Material	39	-	-	2		97	138
53 General Merchandise	2,898	16	6	601	30	3,116	6,657
54 Food	172	12	20	26	42	155	427
55 Auto Related	26	-	1	6	77	57	167
56 Apparel	4,543	15	88	108	12	393	5,159
57 Furniture	269	29	2	30	25	277	632
58 Eating & Drinking	2,148	269	1,013	704	277	1,232	5,643
59 Miscellaneous	1,655	255	120	136	42	761	2,969
Fire/Insurance/Real Estate							
60 Banking	8,750	-	39	414	62	597	9,862
61 Credit	1,203	-	2	61	65	431	1,762
62 Brokers	3,187		-	9	-	-	3,196
63 Insurance	11,146		-	278	633	1,758	13,815
64 Insurance Brokers	3,468		-	38	60	558	4,124
65 Real Estate	1,942	125	50	85	78	425	2,705
66 Real Estate Combination	191		-	-	-	-	191
67 Holding Companies	473		-	-	-	56	529
Services							
70 Hotels, etc.	1,318	271	3,013	294	410	1,357	6,663
72 Personal	593	99	151	82	38	461	1,424
73 Miscellaneous Business	3,902	66	35	196	98	3,274	7,571
75 Auto Related	365	20	209	175	81	238	1,088
76 Miscellaneous Repair	13		4	16	16	81	130
78 Motion Pictures	-		2	425	189	222	838
79 Amusement	74	188	75	97	2	46	482
80 Medical	981	363	26	177	28	77	1,652
81 Legal	2,138	-	4	57	47	231	2,477
82 Educational	68	24	5	15	130	132	374
84 Museums			-	-	-	-	-
86 Non-profit Organizations	963	503	222	240	684	777	3,389
88 Private Households	27	17	20	12	12	14	107
89 Miscellaneous	2,608	12	19	29	125	1,874	4,667
Government							
91 Federal Government	361			12	3,567	8,536	12,476
92 State	254				2,801	1,049	4,104
94 Local Government	681		395		2,481	92	3,649
95-96 Other Government	-				73	101	174
99 Non Classifiable	55	1	2		21	9	88
TOTAL	79,240	3,873	5,878	4,773	12,961	55,437	160,337

* C.B.D. as defined by the U.S. Census or Tracts 117,121,123,124,125

Source: Bay Area Transportation Study Commission

INDUSTRIAL/OCCUPATIONAL MATRIX
SAN FRANCISCO CBD

	Professional			Managers	Clerical	Sales
	Total	Health	Teachers			
20-39 Manufacturing						
23 Apparel	1.27	-	-	4.38	7.87	1.88
27 Printing & Publishing	11.12	-	-	10.01	22.56	10.72
20 Food	2.68	-	-	8.13	12.25	4.59
Transportation						
41 Local Transit	1.22	-	-	5.07	11.96	-
42 Truck & Warehousing	.67	-	-	9.90	15.80	1.31
44 Water Transportation	2.23	-	-	-	15.69	.43
45 Air Transportation	15.50	-	-	-	30.41	.58
47 Transportation Services	2.53	-	-	-	-	-
48 Communications	15.23	-	-	5.30	47.97	1.59
49 Utilities	8.10	-	-	5.24	18.65	.74
50-51 Wholesale Trade	3.06	-	-	21.00	23.17	19.16
Retail Trade						
52 Building Material	.68	-	-	25.13	15.72	19.28
53 General Merchandise	1.44	-	-	17.69	21.39	43.10
54 Food	.37	-	-	23.07	26.09	20.70
55 Auto Related	.44	-	-	26.92	7.89	11.66
56 Apparel	.61	-	-	24.58	15.26	42.95
57 Furniture	1.86	-	-	22.35	16.44	24.79
58 Eating & Drinking	1.02	-	-	21.11	4.67	1.24
59 Miscellaneous	8.55	-	-	22.55	13.58	31.19
Fire/Insurance/Real Estate						
60 Banking	3.00	-	-	21.70	48.31	17.86
61 Credit	2.63	.02	.02	26.05	64.80	2.98
62 Brokers	9.70	-	-	30.10	41.01	16.34
63 Insurance	3.33	.06	.02	13.68	50.95	29.47
64 Insurance Brokers	-	-	-	-	-	-
65 Real Estate	1.12	-	-	25.07	19.46	27.70
66 Real Estate Combination	-	-	-	-	-	-
67 Holding Companies	-	-	-	-	-	-
Services						
70 Hotels	2.21	-	-	21.97	11.91	.23
72 Personal	5.07	.22	-	8.72	8.55	1.09
73 Miscellaneous Business	14.28	.12	.04	18.79	30.05	3.71
75 Auto	.39	-	.24	16.84	5.47	.94
76 Miscellaneous Repair	.64	-	.02	11.00	5.21	.98
78 Motion Pictures	25.01	.11	.08	17.17	20.77	3.01
79 Amusement	19.15	.07	.87	16.30	9.54	1.11
80 Medical	37.28	34.63	.16	12.26	18.29	.04
81 Legal	56.33	.10	-	.75	42.12	.04
82 Educational (Private)	65.46	.99	49.17	3.09	12.03	.17
84 Museums						
86 Non-profit Organizations	32.18	1.00	.65	8.32	25.45	.75
88 Private Households	.12	.07	.02	.04	.22	-
89 Miscellaneous	67.02	.69	.07	3.50	23.35	.48
Government						
91 Federal Government	16.90	.37	.40	9.56	54.29	.08
92 State Government	23.94	-	-	11.47	38.46	.24
94 Local Government	10.54	-	-	11.50	23.14	.08

Source: Keyser/Marston & Associates

Appendix D-6

MAJOR OFFICE BUILDING CONSTRUCTION
SAN FRANCISCO CENTRAL BUSINESS DISTRICT*
1965 - 1970

Year Completed	Building	Gross Leasable Area
1965	Hong Kong Bank	90,000
1965	111 Pine Street	215,000
1965	Standard Oil of California	275,000
1966	Wells Fargo	520,000
1966	Fox Plaza	215,000
1967	Matson Building	105,000
1967	Bank of California	265,000
1968	Bechtel	745,000
1968	First Savings & Loan	180,000
1969	Bank of America	1,495,000
1969	Crocker Plaza	390,000
1969	Mutual Benefit Life	465,000
	1965 - 1968 Assumed 100% leased	2,610,000
	1969 Assume one-third leased	780,000

* Central Business District as defined by the U.S. Census
Source: Keyser/Marston & Associates

Appendix D-7

OCCUPATION OF EMPLOYEES
SAN FRANCISCO CENTRAL BUSINESS DISTRICT 1)
1970 2)

	Professional		Managers	Clerical	Sales	Other	Total
	Other	Health					
Construction							359
Agriculture, Mining & Office							
Manufacturing	1,120	-	944	3,545	481	-	6,090 3)
Food Processing	25	-	75	113	42	666	921
Apparel	31	-	107	193	46	2,072	2,449
Printing	526	-	473	1,068	507	2,148	4,732 3)
Communication	1,072	-	373	3,378	112	2,107	7,042
Utilities	263	-	170	605	24	2,183	3,245
Retail							
52 Building Materials, etc.	1	-	35	22	27	53	138
53 General Merchandise	96	-	1,178	1,423	2,869	1,091	6,657
54 Foods	2	-	99	111	88	127	427
55 Auto	1	-	45	13	19	89	167
56 Apparel	31	-	1,268	792	2,216	852	5,159
57 Furniture	12	-	141	104	157	218	632
58 Eating & Drinking	67	-	1,191	264	70	4,051	5,643
59 Miscellaneous	244	-	670	403	926	726	2,969
Finance, Insurance, Real Estate							
60 Banking	296	-	2,140	4,764	1,761	901	9,862
61 Credit Agencies, etc.	46	-	459	1,142	53	62	1,762
62 Brokers	310	-	962	1,311	522	91	3,196
63 & 64 Insurance	597	-	2,454	9,140	5,290	458	17,939
65 & 67 Real Estate	38	-	859	660	950	918	3,425
Wholesale Trade	336	-	2,310	2,548	2,108	3,698	11,000 3)
Transportation - Other	838	-	2,509	4,832	279	835	9,293
Trucking & Warehousing	2	-	35	55	5	254	351
Local Transit	27	-	114	268	-	1,830	2,239

Continued . . .

Appendix D-7
(Continued)

	Professional			Managers	Clerical	Sales	Other	Total
	Other	Health	Teachers					
Services								
70 Hotel	147	-	-	1,463	795	15	4,243	6,663
72 Personal	69	3	-	124	122	15	1,091	1,424
73 Miscellaneous Business	1,072	9	-	1,423	2,275	281	2,511	7,571
75 Auto Related	4	-	-	183	60	10	831	1,088
76 Miscellaneous Repair	1	-	-	14	7	1	107	130
78 Motion Picture	210	-	-	144	174	25	285	838
79 Amusement	92	-	-	79	46	5	260	482
80 Medical	43	572	-	203	302	-	592	1,652
81 Legal	1,395	-	-	18	1,043	4	17	2,477
82 Education	60	3	182	12	45	-	72	374
84 & 86 Museums & Non Profit Organizations	1,034	34	22	282	862	25	1,130	3,389
88 Private Household	-	-	-	-	-	-	107	107
89 Miscellaneous	3,096	32	-	163	1,090	22	264	4,667
Government								
91 Federal	2,008	50	50	1,193	6,773	10	2,392	12,476
92 State	432	-	-	471	1,578	10	1,613	4,104
94 Local	874	-	-	418	1,403	-	954	3,649
Sub Total	16,518	703	254	24,801	53,329	18,975	42,166	156,746
Add 1965-1970 Adjustment - (Occupational mix of employment in new buildings)	2,495			2,230	7,418	1,042	480	13,680
TOTAL	19,462	703	254	27,031	60,747	20,017	42,646	170,426
Percent Composition	11.3%	.4%	.1%	15.8%	36.3%	11.7%	24.4%	100.0%

1) Based on 1965 BATSC Survey and adjusted to 1970 levels as noted.
2) U.S. Census definition of CBD or Tracts 117, 121, 122, 123, 124, 125, and 176.
3) Adjusted downward to reflect estimated decrease between 1965 and 1970 based on State Employment data for City of San Francisco (General manufacturing reduced 1,000, printing 1,000, wholesale trade 3,000).

Appendix D-8

OCCUPATION OF EMPLOYED RESIDENTS
SAN FRANCISCO NEIGHBORHOODS*
1970 LEVEL

		Professional				Managerial	Sales	Clerical	Other	Total
		Total	Health	Education	Other					
1.	Richmond	7,765	1,893	1,055	4,787	3,345	3,160	11,359	11,728	37,357
2.	Marina	6,577	1,161	901	4,515	3,156	2,527	7,468	4,307	24,035
3.	Northeast	6,594	891	698	5,005	3,562	2,913	10,149	13,592	36,810
4.	Downtown	1,839	190	108	1,541	1,277	11,038	5,386	6,533	16,073
5.	Western Addition	3,536	753	536	2,247	1,292	1,235	6,007	8,816	20,886
6.	Buena Vista	3,472	597	491	2,384	985	781	4,786	6,443	16,467
7.	Central	5,446	1,091	864	3,391	1,952	1,583	7,657	8,794	25,432
8.	Mission	1,571	223	203	1,145	753	758	5,101	11,510	19,693
9.	South of Market	837	136	99	603	320	207	1,439	3,113	5,916
10.	South Bayshore	539	102	85	352	238	285	2,365	5,890	9,317
11.	Bernal Heights	872	161	116	595	371	441	2,543	5,044	9,271
12.	South Central	2,241	497	380	1,364	1,460	1,518	7,408	13,752	26,379
13.	Ingleside	4,507	918	748	2,841	2,234	2,061	6,414	8,319	23,535
14.	Inner Sunset	5,310	1,595	666	3,049	1,753	1,511	5,390	4,726	18,690
15.	Outer Sunset	4,751	961	706	3,084	2,550	2,661	8,575	9,557	28,094
	Total SF	55,878	11,178	7,686	37,014	25,287	27,705	92,173	117,266	318,311
	Total SMSA	230,086	35,948	37,472	156,666	119,603	103,599	292,149	522,206	1,267,643

* Neighborhoods as defined by the San Francisco City Planning Department

Source: U.S. Census
Keyser/Marston & Associates

Appendix D-9

OCCUPATION OF EMPLOYED RESIDENTS
SAN FRANCISCO NEIGHBORHOODS*
1970 PERCENT DISTRIBUTION

	Professional				Managerial	Sales	Clerical	Other	Total
	Total	Health	Education	Other					
1. Richmond	20.6	5.1	2.8	12.6	9.0	8.5	30.4	31.4	100.0
2. Marina	27.4	4.8	3.8	18.8	13.1	10.5	31.1	17.9	100.0
3. Northeast	17.9	2.4	1.9	13.6	9.7	7.9	27.6	36.9	100.0
4. Downtown	11.4	1.2	.7	9.6	8.0	6.5	33.5	40.6	100.0
5. Western Addition	16.9	3.6	2.6	10.8	6.2	5.9	28.8	42.2	100.0
6. Buena Vista	21.1	3.6	3.0	14.5	6.0	4.7	29.1	39.1	100.0
7. Central	21.4	4.3	3.4	13.3	7.7	6.2	30.1	34.6	100.0
8. Mission	8.0	1.1	1.0	5.8	3.8	3.9	25.9	58.5	100.0
9. South of Market	14.2	2.3	1.7	10.2	5.4	3.5	24.3	52.6	100.0
10. South Bayshore	5.8	1.1	.9	3.8	2.6	3.1	25.4	63.2	100.0
11. Bernal Heights	9.4	1.7	1.2	6.4	4.0	4.8	27.4	54.4	100.0
12. South Central	8.5	1.9	1.4	5.2	5.5	5.8	28.1	52.1	100.0
13. Ingleside	19.2	3.9	3.2	12.1	9.5	8.8	27.3	35.4	100.0
14. Inner Sunset	28.4	8.5	3.6	16.3	9.4	8.1	28.8	25.3	100.0
15. Outer Sunset	16.9	3.4	2.5	11.0	9.1	9.5	30.5	34.0	100.0
Total SF	17.5	3.5	2.4	11.6	7.9	8.7	29.0	36.8	
Total SMSA	18.2	2.8	3.0	12.4	9.4	8.2	23.0	41.2	

*Neighborhoods as defined by the San Francisco City Planning Department
Source: U.S. Census
Keyser/Marston & Associates

APPENDIX D-10

INCOME DISTRIBUTION
SAN FRANCISCO NEIGHBORHOODS
1970

		0-3,999	4,000-6,999	7,000-9,999	10,000-14,999	15,000-24,999	25,000+
1.	Richmond	10.2	12.8	18.0	26.6	22.2	10.3
2.	Marina	8.9	8.9	12.8	22.8	27.5	19.2
3.	Northeast	16.8	17.3	16.5	22.9	16.2	10.3
4.	Downtown	23.7	26.8	21.1	16.6	10.1	1.7
5.	Western Addition	24.9	22.5	19.7	18.6	10.6	3.7
6.	Buena Vista	19.4	21.0	19.7	22.8	13.0	4.0
7.	Central	11.6	14.8	19.2	29.3	20.1	5.0
8.	Mission	24.9	22.6	20.8	20.9	9.6	1.3
9.	South of Market	24.6	21.7	21.1	18.0	12.2	2.4
10.	South Bayshore	22.9	19.4	17.9	23.8	13.8	2.3
11.	Bernal Heights	19.2	14.4	21.2	27.5	14.8	2.9
12.	South Central	13.7	13.1	18.3	30.5	21.1	3.3
13.	Ingleside	7.2	10.8	15.0	28.2	27.4	11.5
14.	Inner Sunset	8.2	11.4	14.1	26.2	27.9	12.1
15.	Outer Sunset	7.5	10.9	16.8	31.4	27.5	5.8
	Total San Francisco	14.3	15.1	17.6	25.8	20.0	7.2
	Total SMSA	10.3	11.6	16.5	29.4	24.4	7.7

Source: U.S. Census
Keyser/Marston & Associates

Appendix D-11

INCOME OF RESIDENTS
SAN FRANCISCO NEIGHBORHOODS*
1969

	0 - 3,999	4,000 - 6,999	7,000 - 9,999	10,000 - 14,999	15,000 - 24,999	25,000 +	Total
1. Richmond	2,020	2,518	3,543	5,246	4,372	2,037	19,736
2. Marina	837	840	1,199	2,143	2,587	1,807	9,407
3. Northeast	2,422	2,494	2,377	3,311	2,347	1,494	14,449
4. Downtown	849	958	756	595	363	60	3,581
5. Western Addition	2,421	2,187	1,916	1,813	1,027	356	9,720
6. Buena Vista	1,380	1,492	1,397	1,621	924	287	7,101
7. Central	1,389	1,775	2,308	3,517	2,411	599	11,999
8. Mission	2,855	2,586	2,384	2,393	1,098	153	11,469
9. South of Market	963	851	825	705	478	93	3,915
10. South Bayshore	1,627	1,376	1,270	1,691	978	164	7,106
11. Bernal Heights	1,085	811	1,197	1,550	831	161	5,635
12. South Central	2,390	2,287	3,183	5,317	3,680	571	17,428
13. Ingleside	1,057	1,597	2,208	4,162	4,036	1,697	14,757
14. Inner Sunset	877	1,207	1,498	2,788	2,971	1,291	10,632
15. Outer Sunset	1,320	1,916	2,962	5,519	4,834	1,024	17,575

* Neighborhoods as defined by the San Francisco City Planning Department
Source: U.S. Census
Keyser/Marston & Associates

Appendix D-12

DISTRIBUTION OF OWNED VS. RENTED UNITS*
SAN FRANCISCO NEIGHBORHOODS
1970

Neighborhood	Number			Percent	
	Owned Units	Rental Units	Total	Owned	Rented
1. Richmond	8,237	19,090	27,327	30.5%	69.5%
2. Marina	1,754	18,809	20,563	8.5%	91.5%
3. Northeast	607	30,238	30,845	2.0%	98.0%
4. Downtown	(D)**	25,315	(D)**	(D)**	(D)**
5. Western Addition	673	18,158	18,831	3.6%	96.4%
6. Buena Vista	1,041	12,598	13,639	7.6%	92.4%
7. Central	5,293	13,692	18,985	27.9%	72.1%
8. Mission	1,265	17,006	18,271	6.9%	93.1%
9. South of Market	925	5,498	6,423	14.4%	85.6%
10. South Bayshore	3,625	4,556	8,181	44.3%	55.7%
11. Bernal Heights	3,280	3,894	7,174	45.7%	54.3%
12. South Central	14,082	6,747	20,829	67.6%	32.4%
13. Ingleside	11,895	6,739	18,634	63.8%	36.2%
14. Inner Sunset	7,692	7,366	15,058	51.1%	48.9%
15. Outer Sunset	15,701	6,553	22,254	70.6%	29.4%

* Data refers only to units for which single family house value or rent information is provided. Other units such as duplexes are not included in Census published materials.

** (D) indicates data not published in the Census for disclosure reasons due to small numbers of owned units per tract.

Source: U.S. Census
Keyser/Marston & Associates

Appendix D-13

HOUSE VALUE DISTRIBUTION
SAN FRANCISCO NEIGHBORHOODS
1970

Neighborhood	Number			Percent	
	Over $35,000	$25,000 - $34,999	Total Units	% Over $35,000	% Over $25,000
1. Richmond	3,461	3,102	8,237	42.0%	79.7%
2. Marina	1,546	130	1,754	88.1%	95.5%
3. Northeast	414	93	607	68.2%	83.5%
4. Downtown	(D)	(D)	13	(D)	(D)
5. Western Addition	354	163	673	52.6%	76.8%
6. Buena Vista	400	316	1,041	38.4%	68.8%
7. Central	1,152	1,567	5,293	21.8%	51.4%
8. Mission	157	352	1,265	12.4%	40.2%
9. South of Market	86	219	925	9.3%	33.0%
10. South Bayshore	224	1,190	3,625	6.2%	39.0%
11. Bernal Heights	141	734	3,280	4.3%	26.7%
12. South Central	1,031	4,911	14,082	2.5%	37.4%
13. Ingleside	3,852	3,628	11,895	32.4%	62.9%
14. Inner Sunset	3,468	3,143	7,692	45.1%	42.0%
15. Outer Sunset	1,976	8,924	15,701	11.4%	68.2%
Total San Francisco	18,305	28,512	76,202	24.0%	61.4%
Total SMSA	121,720	160,075	504,047	24.1%	56.0%

Source: U.S. Census
Keyser/Marston & Associates

Appendix D-14

RENT LEVEL DISTRIBUTION
SAN FRANCISCO NEIGHBORHOODS
1970

		Number			Percent	
		$200/mo. or more	$150 - $199/mo.	Total Units	Over $200/Mo.	Over $150/Mo.
1.	Richmond	2,524	6,943	19,090	13.2%	49.6%
2.	Marina	5,741	5,867	18,809	30.5%	61.7%
3.	Northeast	4,512	5,929	30,238	14.9%	34.5%
4.	Downtown	461	2,341	25,315	1.8%	11.0%
5.	Western Addition	1,341	2,652	18,158	7.4%	22.0%
6.	Buena Vista	755	2,203	12,598	6.0%	23.5%
7.	Central	1,648	4,027	13,692	12.0%	41.4%
8.	Mission	189	1,522	17,006	1.1%	10.1%
9.	South of Market	107	429	5,498	1.9%	9.7%
10.	South Bayshore	37	378	4,556	.8%	9.1%
11.	Bernal Heights	92	636	3,894	2.4%	18.7%
12.	South Central	320	2,004	6,747	4.7%	34.4%
13.	Ingleside	1,750	2,789	6,739	26.0%	67.4%
14.	Inner Sunset	1,019	2,531	7,366	13.8%	48.2%
15.	Outer Sunset	1,144	2,798	6,553	17.5%	60.2%
	Total San Francisco	21,665	43,066	197,283	11.0%	32.8%
	Total SMSA	54,942	121,276	521,361	10.5%	33.8%

Source: U.S. Census
Keyser/Marston & Associates

Appendix D-15

AGE OF RESIDENTS
SAN FRANCISCO NEIGHBORHOODS*
1970

	Age Bracket						
	0 - 4	5 - 19	20 - 34	35 - 54	55 - 64	65 +	Total
1. Richmond	4,331	14,390	19,554	18,369	9,092	12,499	78,235
2. Marina	1,275	3,529	13,512	10,062	5,512	8,257	42,147
3. Northeast	2,806	11,470	18,653	18,212	8,486	10,407	70,034
4. Downtown	538	1,360	8,124	8,957	5,610	9,089	33,678
5. Western Addition	3,255	9,194	14,693	10,359	4,562	5,513	47,574
6. Buena Vista	2,383	6,036	12,759	7,131	3,014	3,464	34,787
7. Central	3,444	9,260	16,097	11,599	5,045	5,647	51,092
8. Mission	4,701	11,627	12,889	11,229	5,229	6,199	51,874
9. South of Market	1,869	5,924	7,899	4,411	1,575	1,369	23,047
10. South Bayshore	2,976	10,490	6,997	6,544	2,732	2,016	31,755
11. Bernal Heights	2,058	6,165	5,591	5,183	2,356	2,270	23,623
12. South Central	4,780	16,726	12,343	15,591	8,083	8,055	65,578
13. Ingleside	3,006	12,200	9,627	13,409	7,748	7,920	53,910
14. Inner Sunset	2,097	7,311	1,041	9,539	5,361	6,987	41,706
15. Outer Sunset	3,086	12,200	11,246	15,215	9,885	10,030	61,662

* Neighborhoods as defined by the San Francisco City Planning Department.
Source: U.S. Census
Keyser/Marston & Associates

AGE GROUP PERCENT DISTRIBUTION
SAN FRANCISCO NEIGHBORHOODS
1970

Neighborhood	Age Group					
	0 - 4	5 - 19	20 - 34	35 - 54	55 - 64	65 +
1. Richmond	5.0	18.4	25.0	23.4	11.6	16.0
2. Marina	3.0	8.4	32.0	23.8	13.0	19.6
3. Northeast	4.1	16.3	26.6	26.0	12.1	14.9
4. Downtown	1.6	4.0	24.1	26.6	16.7	27.0
5. Western Addition	6.8	19.3	30.9	21.8	9.6	11.6
6. Buena Vista	6.8	17.4	36.2	20.5	8.7	10.0
7. Central	6.7	18.1	31.5	22.7	9.9	11.1
8. Mission	9.1	22.4	24.8	21.7	10.1	12.0
9. South of Market	8.1	25.7	34.3	19.1	6.8	6.0
10. South Bayshore	9.4	33.0	22.0	20.6	8.6	6.4
11. Bernal Heights	8.7	26.1	23.7	21.9	10.0	9.6
12. South Central	7.3	25.5	18.8	23.8	12.3	12.3
13. Ingleside	5.6	22.6	17.8	24.9	14.4	14.7
14. Inner Sunset	5.0	17.5	25.0	22.9	12.8	16.8
15. Outer Sunset	5.0	19.8	18.2	24.7	16.0	16.3
Total S.F.	6.0	19.4	25.4	23.3	11.9	14.0
Total SMSA	7.4	26.1	23.3	24.3	9.4	9.5

Source: U.S. Census
Keyser/Marston & Associates

Appendix D-17

DWELLING UNITS 10 STORIES AND OVER
BY DATE OF CONSTRUCTION

	Number of Buildings	Number of Units	Square Footage
Pre-1930	29	1,243**	1,442,874
Cuml.*			
1931 - 1940	0	0	0
Cuml.	29	1,243	1,442,874
1941 - 1950	1	62	96,892
Cuml.	30	1,305	1,539,766
1951 - 1960	4	275	319,240
Cuml.	34	1,580	1,859,007
1961 - 1965	31	4,175**	4,088,008
Cuml.	65	5,755	5,947,015
1966 - 1970	4	593	388,768
Cuml.	69	6,348	6,335,783
1971 - 1972	1	72	73,725
Cuml.	70	6,420	6,409,508
Public Housing	9	1,591	N.A.

* Cumulative Total
** Data not complete
Source: Keyser/Marston & Associates

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